I. 기술강좌

2

LBS 상호운용성을 위한 플랫폼

(Open Location Services Platform: The Path to Interoperability for LBS)

2001. 11

Harry Niedzwiadek
(CEO of Image Matters, LLC, USA)

Open Location Services Platform: The Path to Interoperability for LBS

Open GIS Consortium, Inc.

Harry Niedzwiadek
OpenLS Lead Architect, harryn@imagem.cc

The Vision for Open Location Services Platform

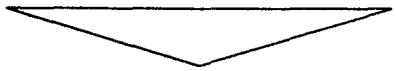
To deliver open interfaces that enable **interoperability** and further enable **actionable, multi-purpose, distributed, value-added** location application services and content to a wide variety of **service points**, wherever they might be, **on any device** (even if the service points are buried in applications or embedded devices).

OGC

What Carriers Want

Attractive Applications

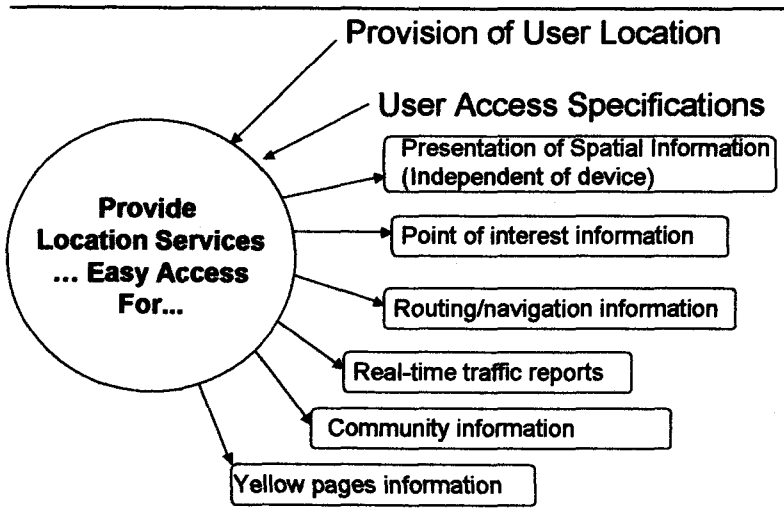
- Start Simple over wide geographies
- Expand easily
- Keep introducing new, exciting applications



Increasing ARPU, New Customers with Minimal Churn

OGC

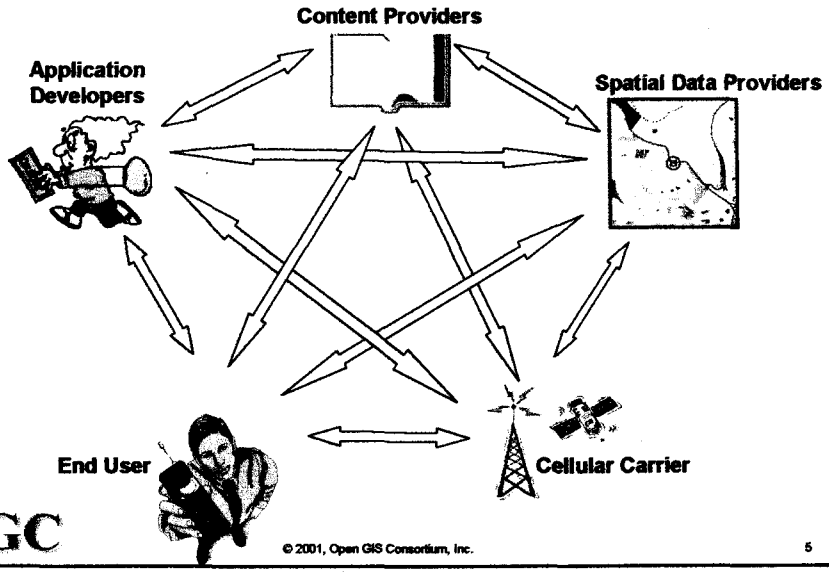
What Application Developers Want



OGC

•Always Most Updated • Always Fresh

Why Service Platforms With Standard Interfaces Are Needed



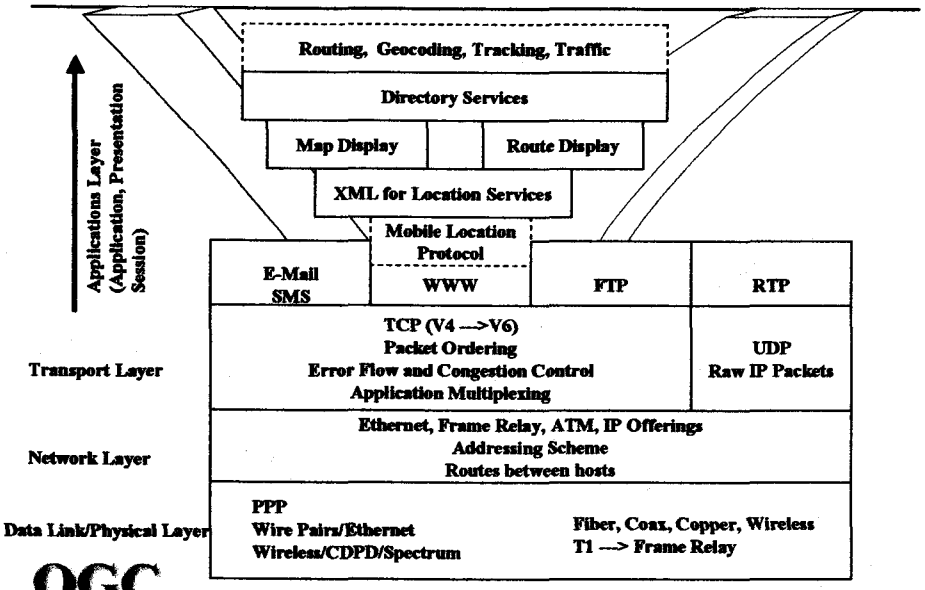
OGC

LBS Business Requirements

- **Shorten Time to Market and Mitigate Risk**
- **Maintain application freshness, utility, variety of services and personal choice**
- **Enable Reliable 24x7x52 service, everywhere (24x7x365 is redundant)**
- **Provide Market Extensibility - support multiple service growth paths with the same interface**
- **Build for performance while enabling acceptable costs and competitive prices with COTS and Internet services**
  - High performance
  - Flexibility
  - Extensibility
  - Scalable
  - Secure and Privacy

OGC

Where is OpenLS in the Stack?



OGC

Purpose of the OpenLS-1 Initiative

- ~300 companies comprise the LBS business space world-wide
- Market lacks an open service architecture
- Integration requirements across carrier properties and partners
  - No assurance offerings work together to form end-to-end solutions
- General recognition on the part of many in the value chain that standards are essential

- OpenLS applies OGC's rapid specification approach to address these challenges
  - Multi-year phased effort - beginning with a single testbed focused on core location services
  - Companion market awareness program
  - Close coordination with other related industry standard fora

OGC

Project Objectives

- Build interfaces for the Core Services (foundational building blocks) for the **Open Location Services Platform**
  - Draft Implementation Specifications for Core Services, encodings and protocols
  - Variety of location-based content
- Employ other industry standards where possible and practical
- Produce robust end-to-end location service solutions based upon **Open Location Services Platform**
  - Open Location Services Platform v 1.0
    - Implementations of each Core Service
  - Several applications that employ the platform
- Demonstrations in various 'strategic' locations
- OpenLS Web site (a node on OGCnetwork)

OGC

OpenLS-1 Sponsors

- ESRI with Sun Microsystems, SignalSoft and Syncline
- Hutchison 3G
- In-Q-Tel
- Oracle with Webraska
- Sun Microsystems with LocatioNet

OGC

OpenLS-1 Participants

- Cquay
- Galdos with Hitachi
- Galdos with NTT Data
- BigTribe
- Intergraph with Compaq and Nav Tech
- ESRI
- IBM
- University of Illinois
- LocatioNet
- MapInfo
- Telecommunications Systems
- SignalSoft
- Sun Microsystems
- Syncline
- Navigation Technologies (NavTech)
- MobileGIS with Telcontar and Tele Atlas
- Opt[e]way
- SICAD Geomatics (Siemens)
- Vodafone
- Webraska
- Ionic
- Laser-Scan with Yeoman Group
- Tata Infotech

USA Canada Europe India Japan

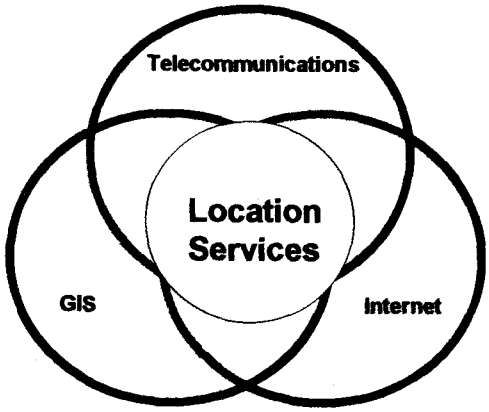
OGC

OpenLS-1 Requirements Set the Initial Scope

- User needs and preferences
  - Derived from market assessments made by sponsors and two iterations of consensus-based user needs assessment with sponsors
- Technology requirements and constraints
  - Derived from technology assessments made by sponsors and two iterations of consensus-based requirements engineering with sponsors
  - Initial set of Core Services were defined according to present state of technology and data
  - Sponsor platform defined according to operational needs and preferences
  - Alternative (participant) platforms allowed for the testbed

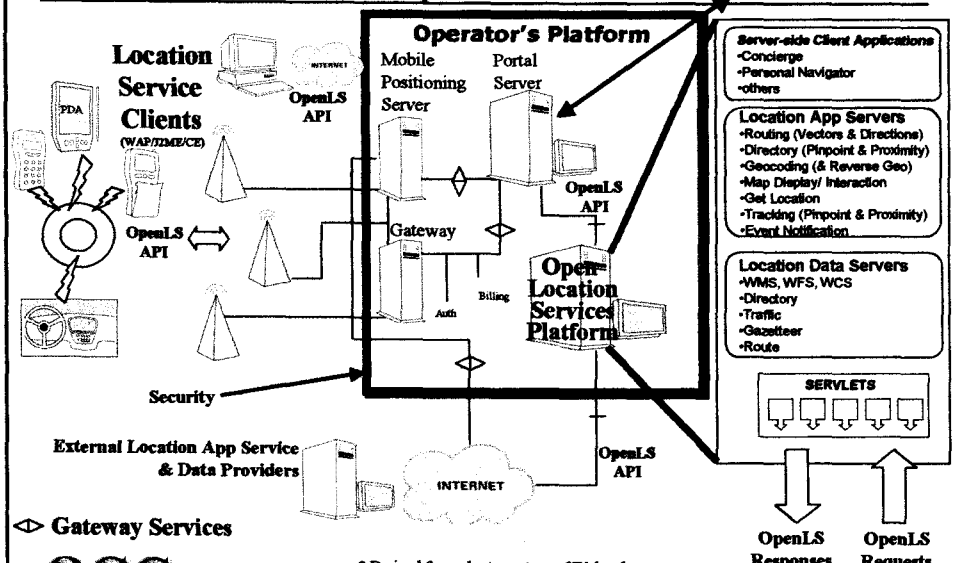
OGC

Technology Context



OGC

Open Location Services Platform Concept



OGC

* Derived from chart courtesy of Webraska

OpenLS-1 Working Groups

- **Navigation Services WG**
  - **John Herring, Oracle**
- **Directory (POI) Services WG**
  - **Vipul Sawhney, LocatioNet**
- **Presentation Services WG**
  - **Serge Margoulies, Ionic**
- **Location Utility Services WG**
  - **Jonathan Williams, Hutchison 3G**
- **Gateway Services WG**
  - **Richard Wong, SignalSoft**
- **Encodings & Protocols WG**
  - **Marwa Mabrouk, ESRI**

OGC

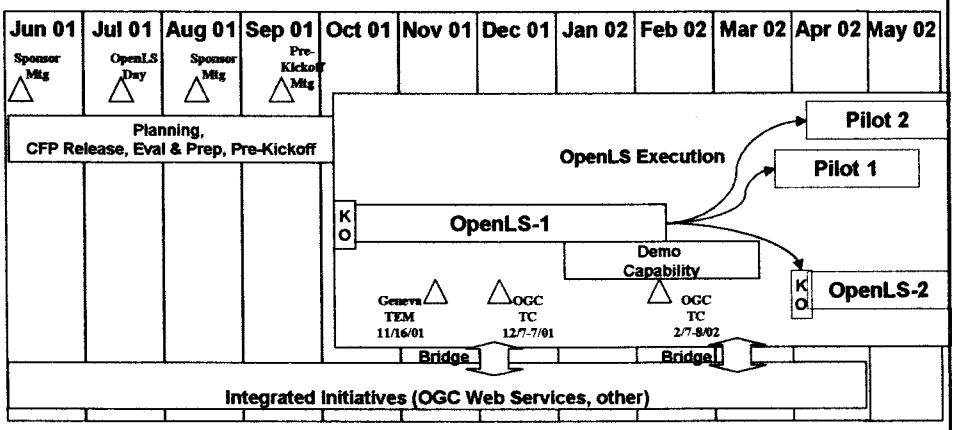
Core Services by Work Groups

- **Navigation Services WG**
  - Determine Route Service
  - Traffic Server (Get Traffic Service)
- **Directory (POI) Services WG**
  - Proximity.directory Service
  - Pinpoint.directory Service
- **Presentation Services WG**
  - Web Map Service
  - Vector Map Portrayal Service
  - Display Route Vectors Service
  - "Display" Route Directions Service
- **Location Utility Services WG**
  - Geocoder Service
  - Reverse Geocoder Service
- **Gateway Services WG**
  - Get Device Location Service (subset of LIF 1.1)
- **Encodings & Protocols WG**
  - XML for Location Services
  - Inter-process (HTTP Post)

Second Priority

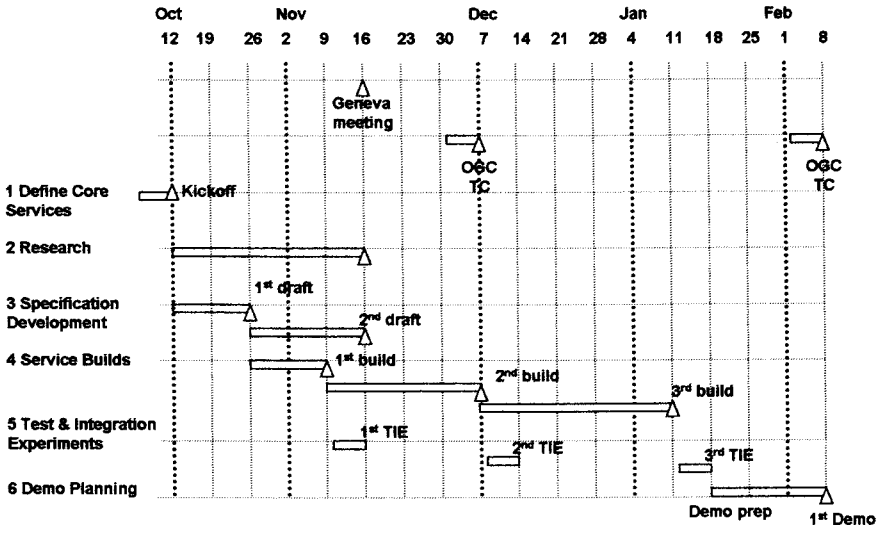
OGC

Schedule & Milestones



OGC

Work Group Schedule



OGC

Q & A With Conference Attendees

Open GIS Consortium, Inc.

OpenLS Interface Engineering Process & Architecture

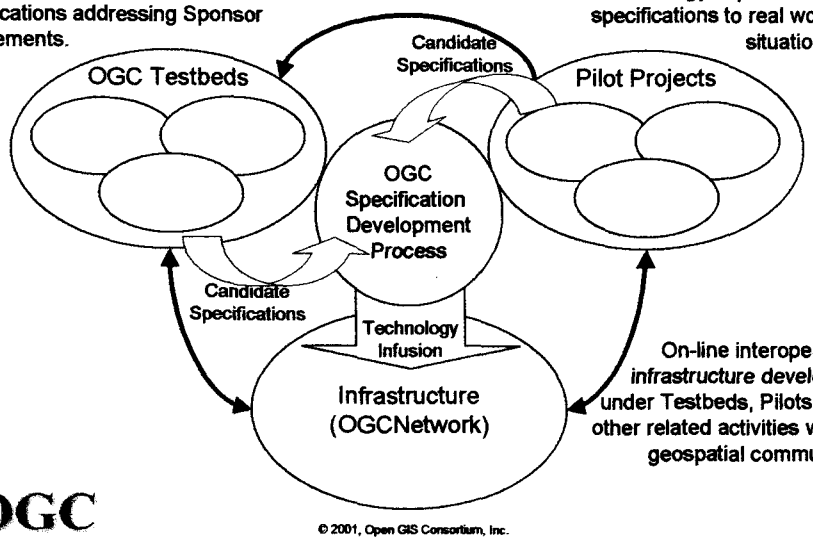
Open GIS Consortium, Inc.

Harry Niedzwiadek
OpenLS Lead Architect, harryn@imagem.cc

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.

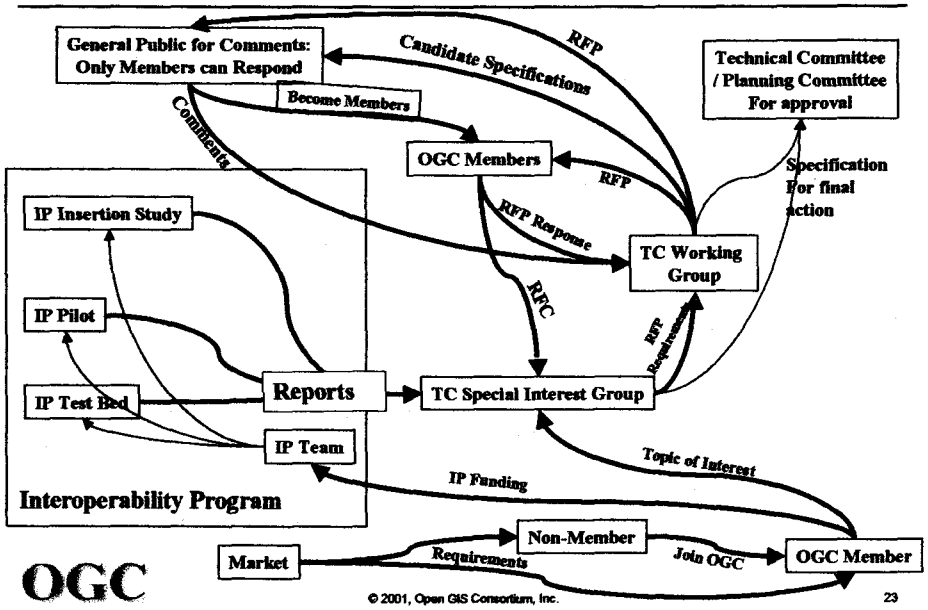
OGC

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

OGC

Combined Progression



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

OGC

24

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

OGC

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

OGC

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

OGC

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

OGC

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!

OGC

OGC

OpenLS Architecture

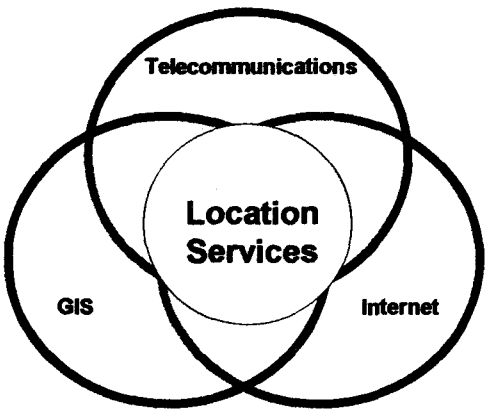
Open GIS Consortium, Inc.

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

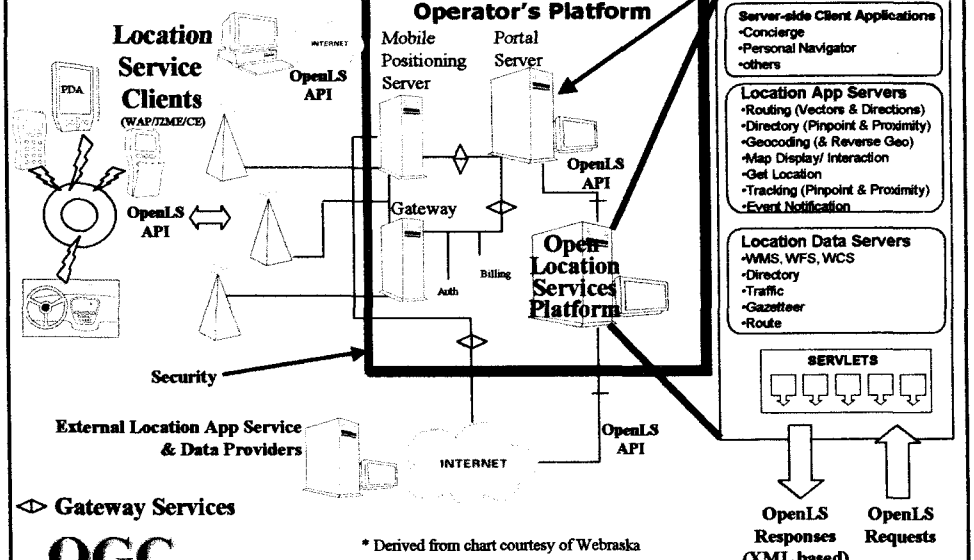
OGC

Technology Context

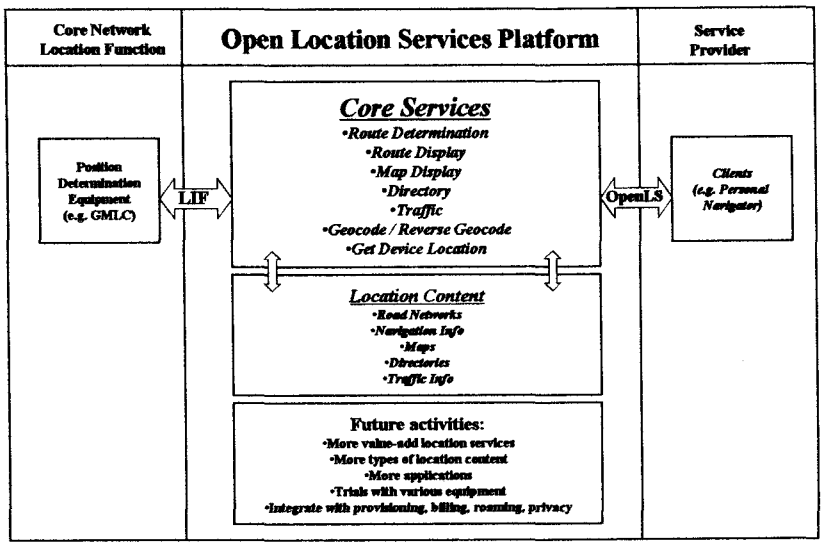


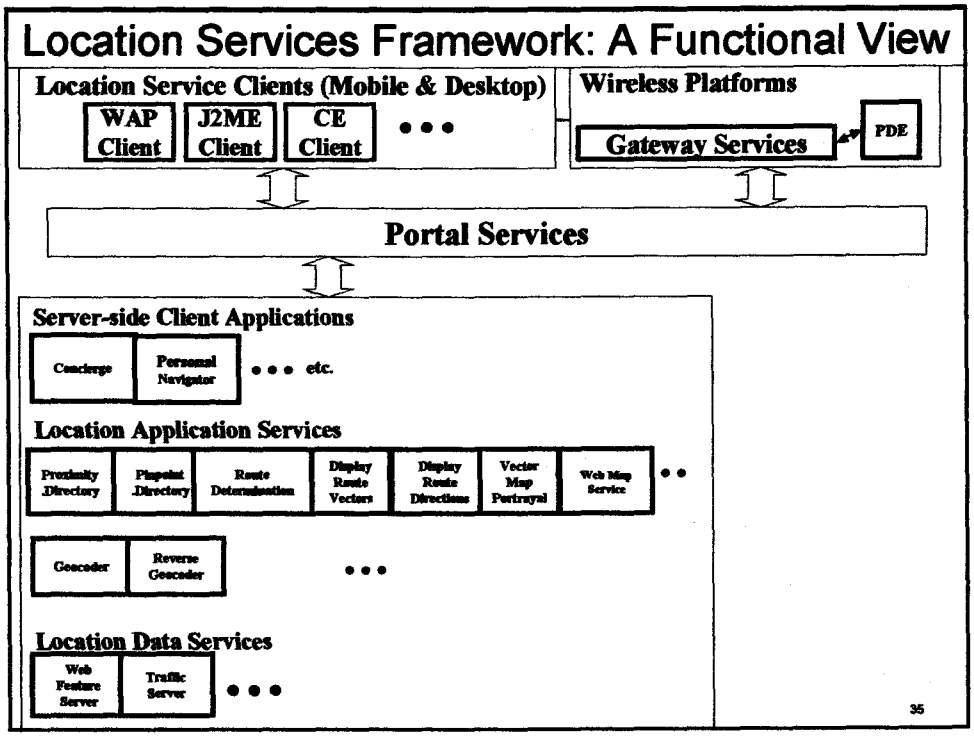
OGC

Open Location Services Platform Concept



Primary Objective: Core Services Comprising the Open Location Services Platform





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

OGC

36

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.

OGC

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.

OGC

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

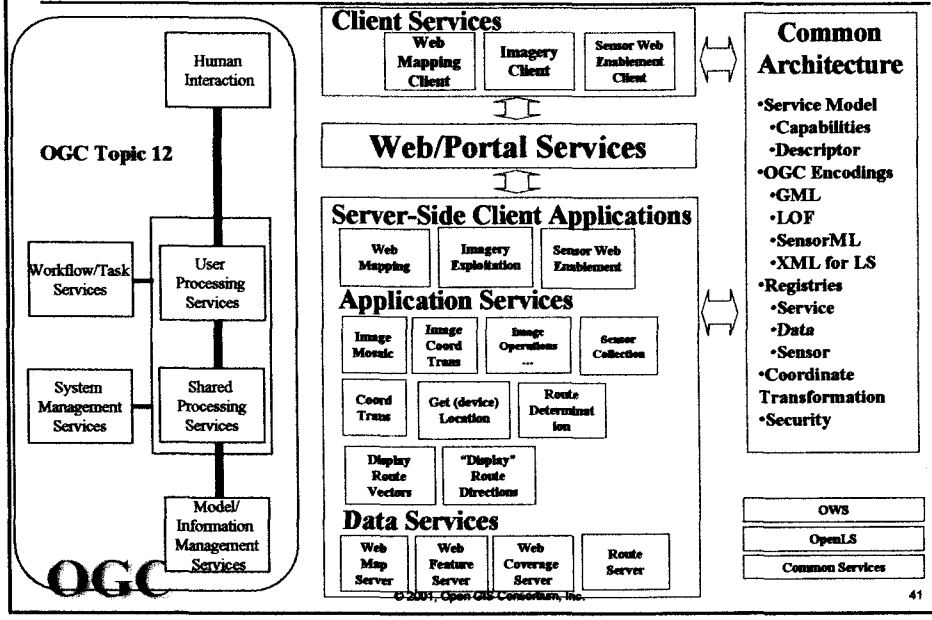
OGC

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

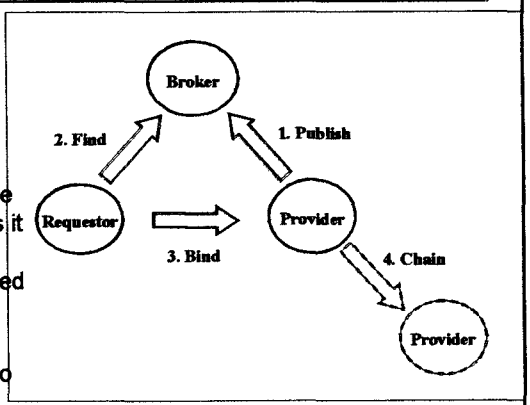
OGC

Common Services Framework (partial)



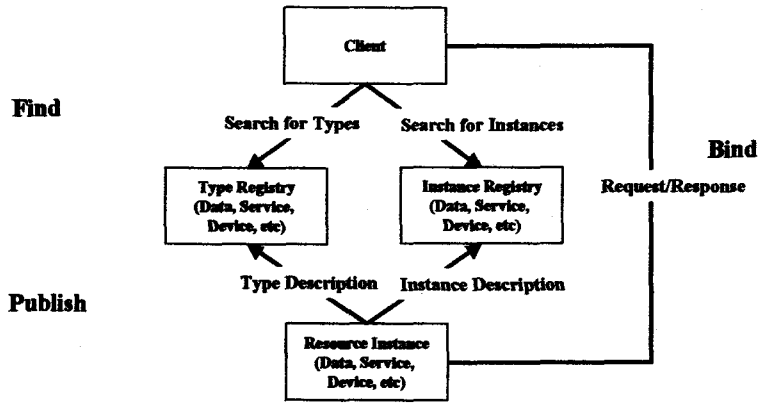
OGC Service Model: The Focus of OWS

- 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



OGC

Registry Interactions



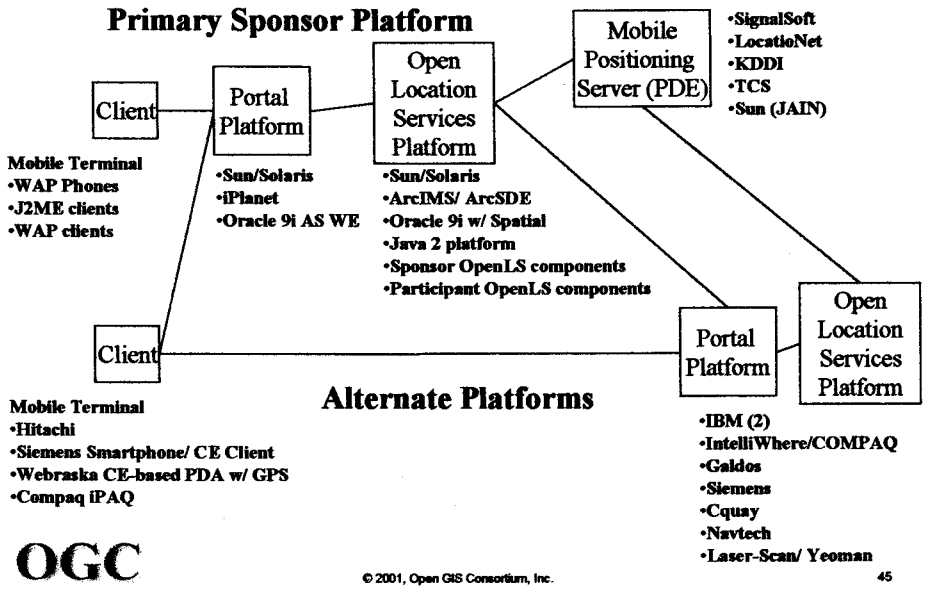
OGC

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

OGC

OpenLS-1 Platform and Demo Components



OGC

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)

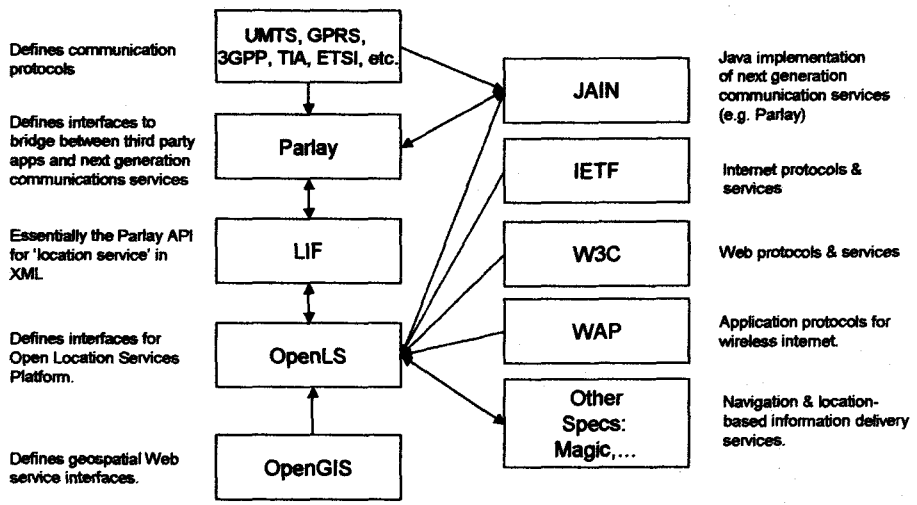
OGC

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

OGC

Location Service Standards Framework



OGC


OGC
Q & A With Workshop Attendees
Open GIS Consortium, Inc.
© 2001, Open GIS Consortium, Inc.


OGC
Backup Slides
Open GIS Consortium, Inc.
© 2001, Open GIS Consortium, Inc.

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)

OGC

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

OGC

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

OGC

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

OGC

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

OGC

Gateway Services WG

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

OGC

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

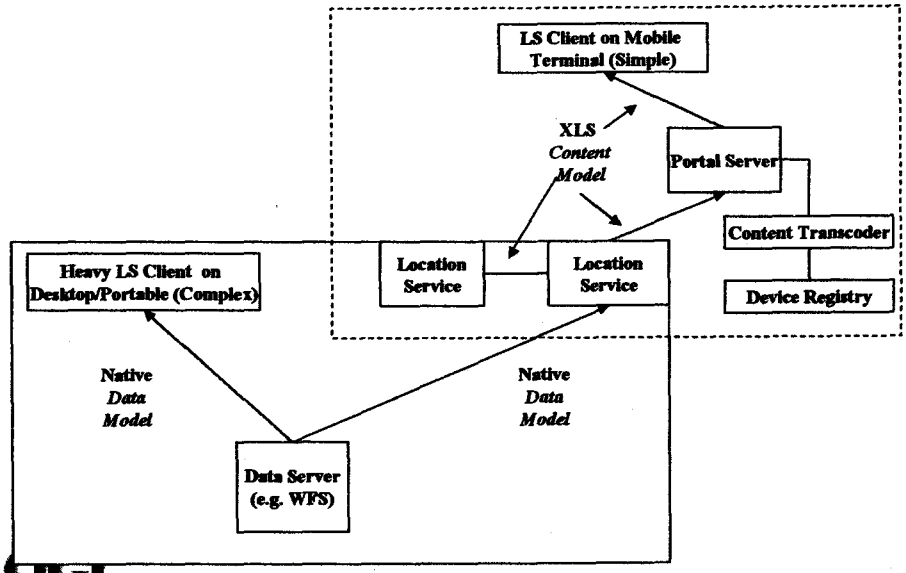
OGC

Encodings & Protocols WG

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

OGC

XML for Location Services



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