LBS Middleware

12.1 Conceptual View of an LBS Middleware
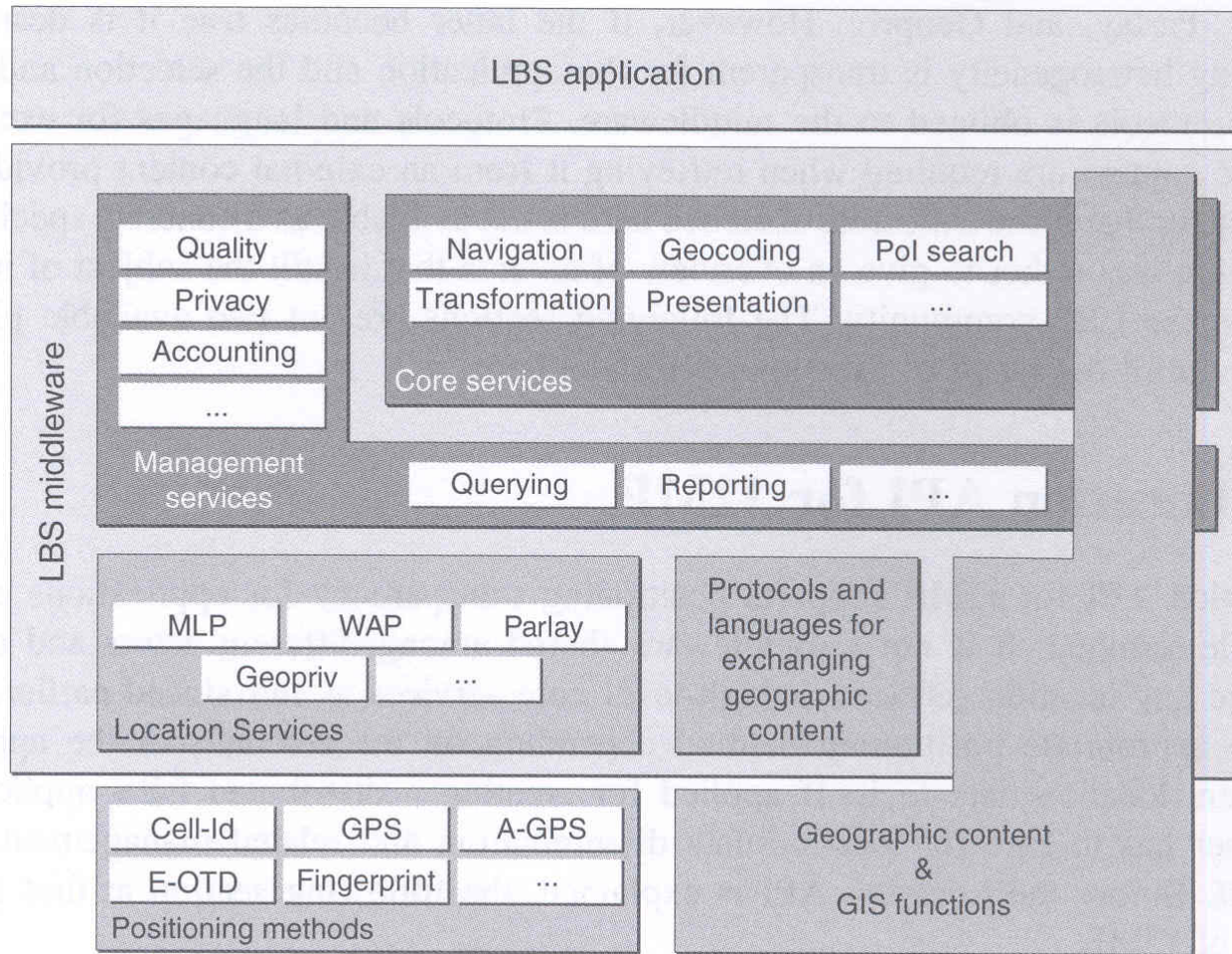
Figure 12.1 LBS middleware.

12.2 Location API for J2ME

12.2.1 Overview of J2ME

Application for servers and enterprise computers

Optional packages

Java 2 Enterprise Edition (J2SE)

JVM

Application for servers and desktops computers

Optional packages

Java 2 Standard Edition (J2SE)

JVM

Application for high-end PDAs, vehicle navigation, TV set-top boxes, embedded systems

Optional packages (e.g., LocationAPI)

Personal profile

Personal basis profile

Foundation profile

CDC

JVM

Application for mobile phones and low-end PDAs

Optional packages (e.g., LocationAPI)

MIDP

CLDC
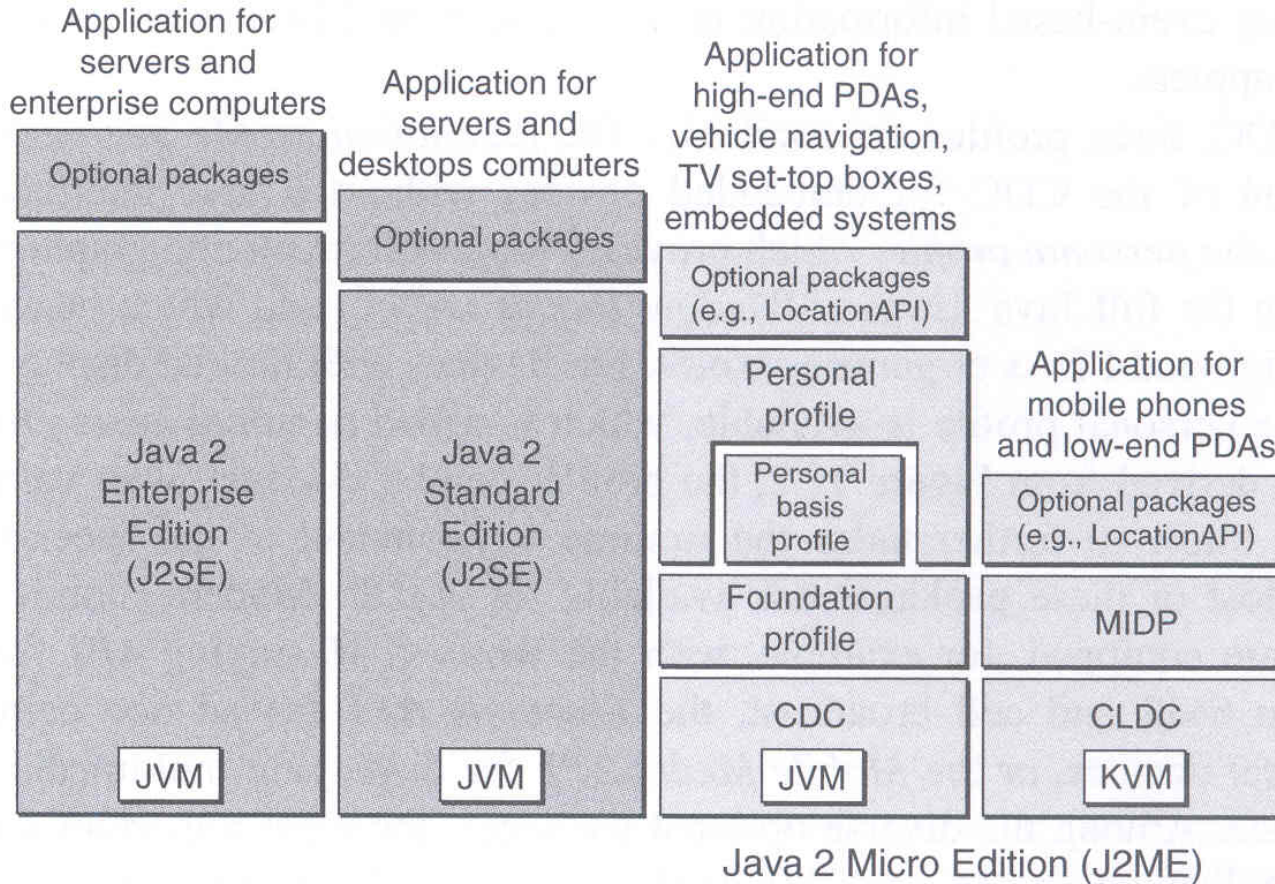
KVM

Java 2 Micro Edition (J2ME)

Figure 12.2 Overview of Java development suites.

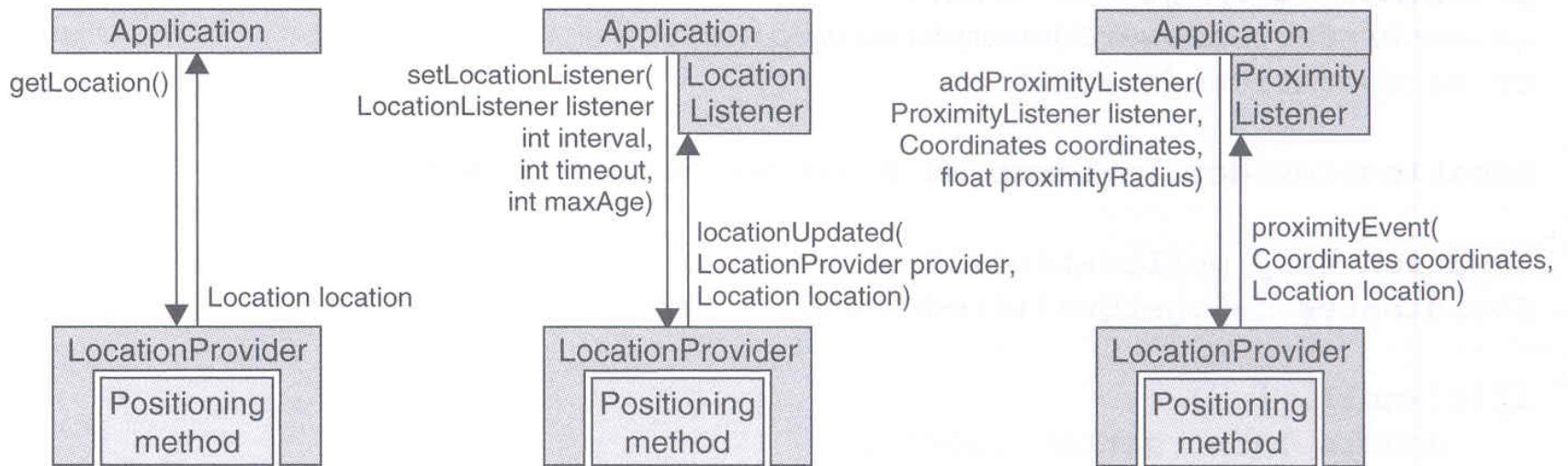## 12.2.2 Location API for J2ME

Figure 12.3 Interaction patterns between application and `LocationProvider`.
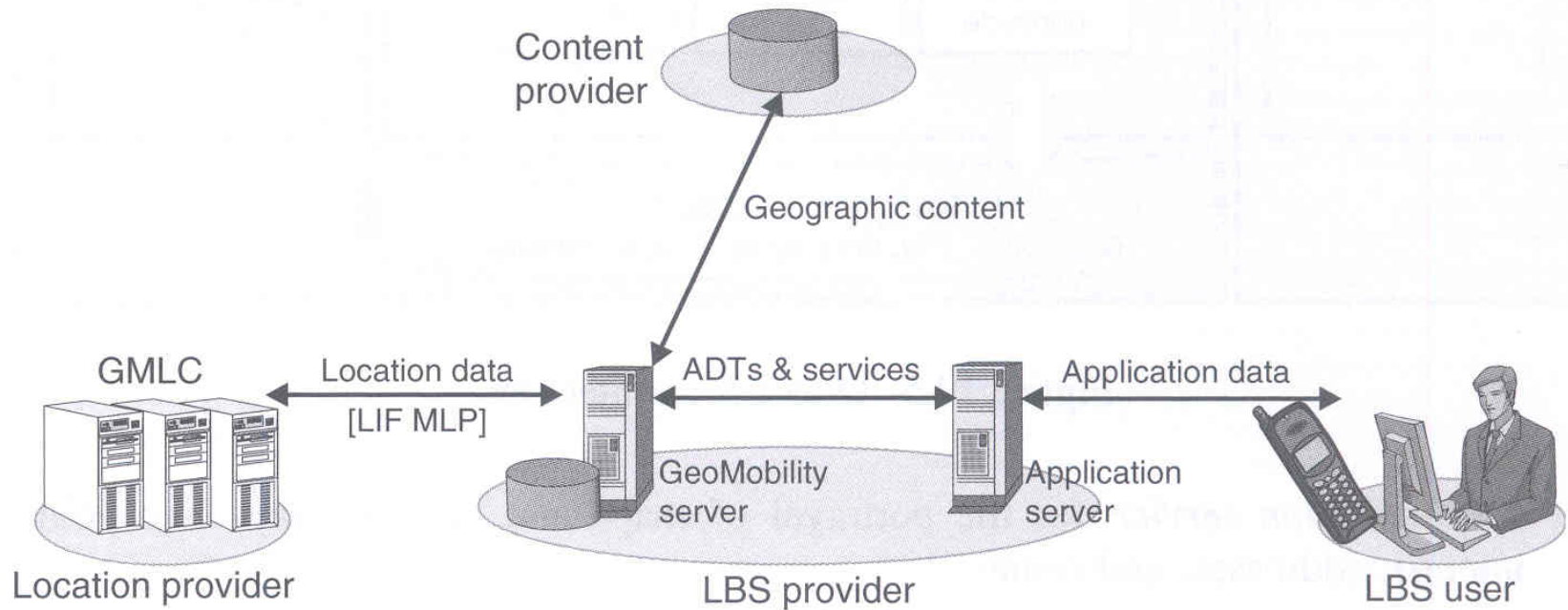
12.3 OpenGIS Location Services

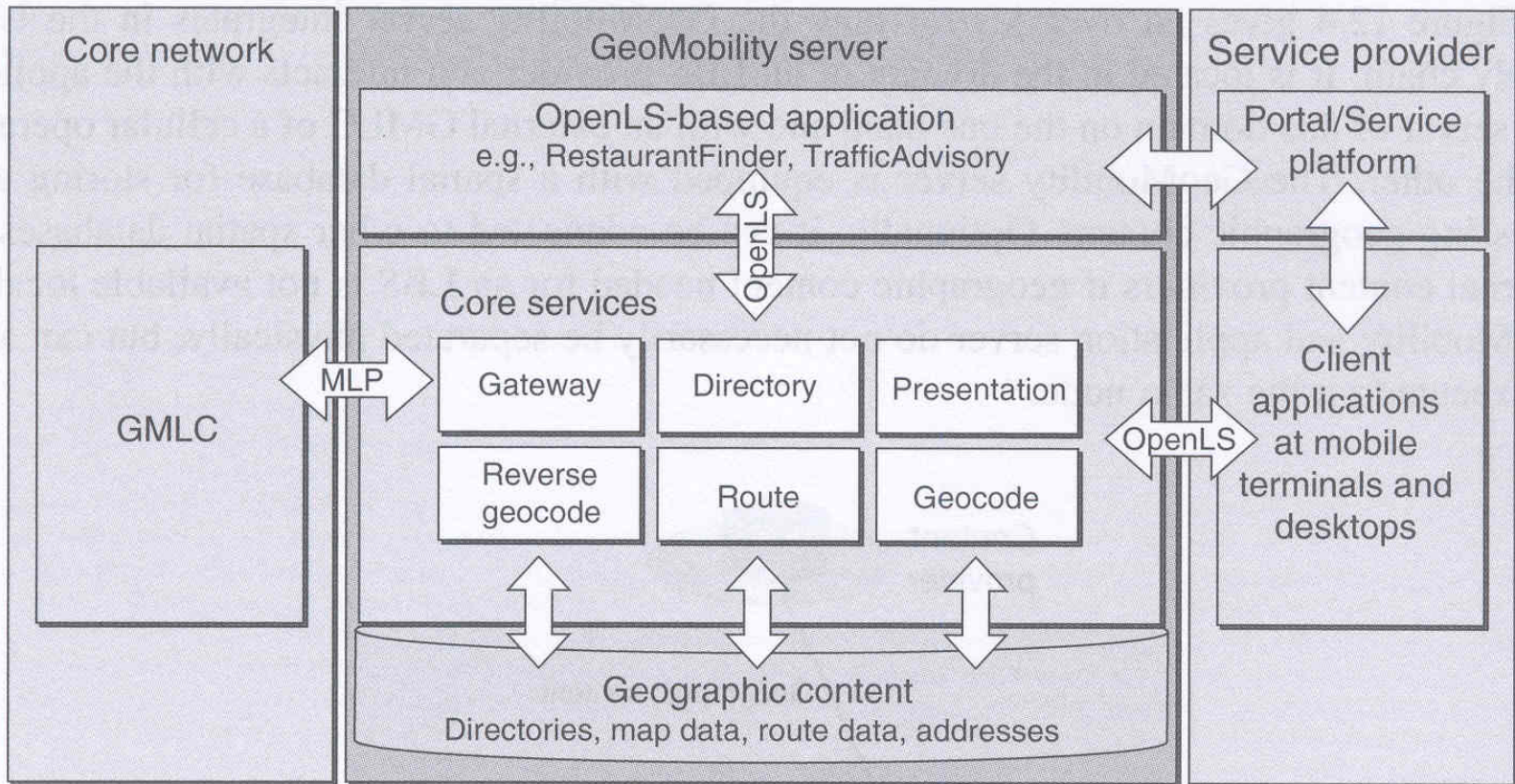Figure 12.4 The GeoMobility server in the LBS supply chain.

Figure 12.5 OpenLS architecture.

- **Portal**

- **Session management**
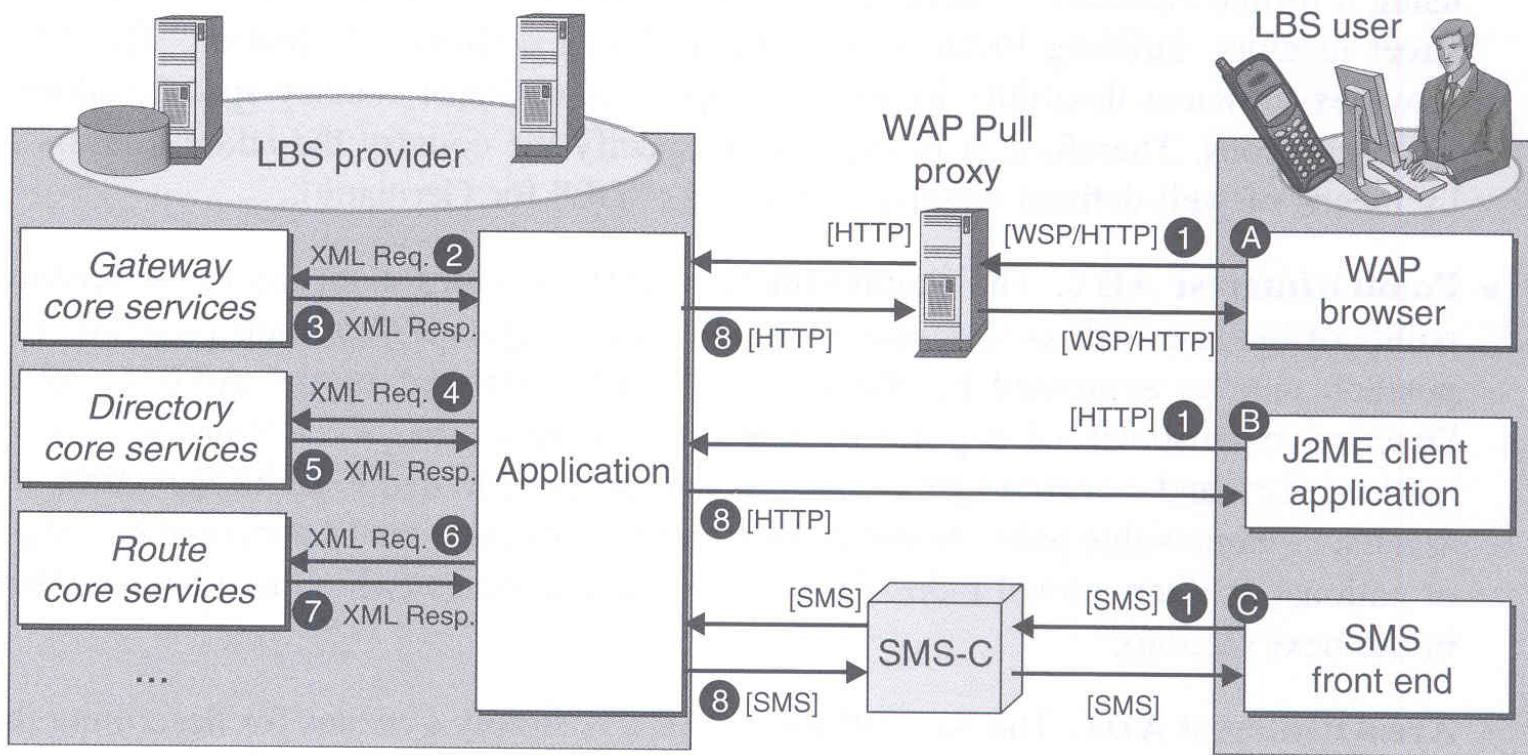
- **Personalization**

- **Management**

Figure 12.6 Request/Response cycle of OpenLS.

12.3.1 Information Model

- **Position ADT**

- **Address ADT**

- **PointOfInterest ADT**

- **AreaOfInterest ADT**

- **Location ADT**

- **RouteSummary ADT**

- **RouteGeometry ADT**

- **RouteInstructionList ADT**

- **Map ADT**

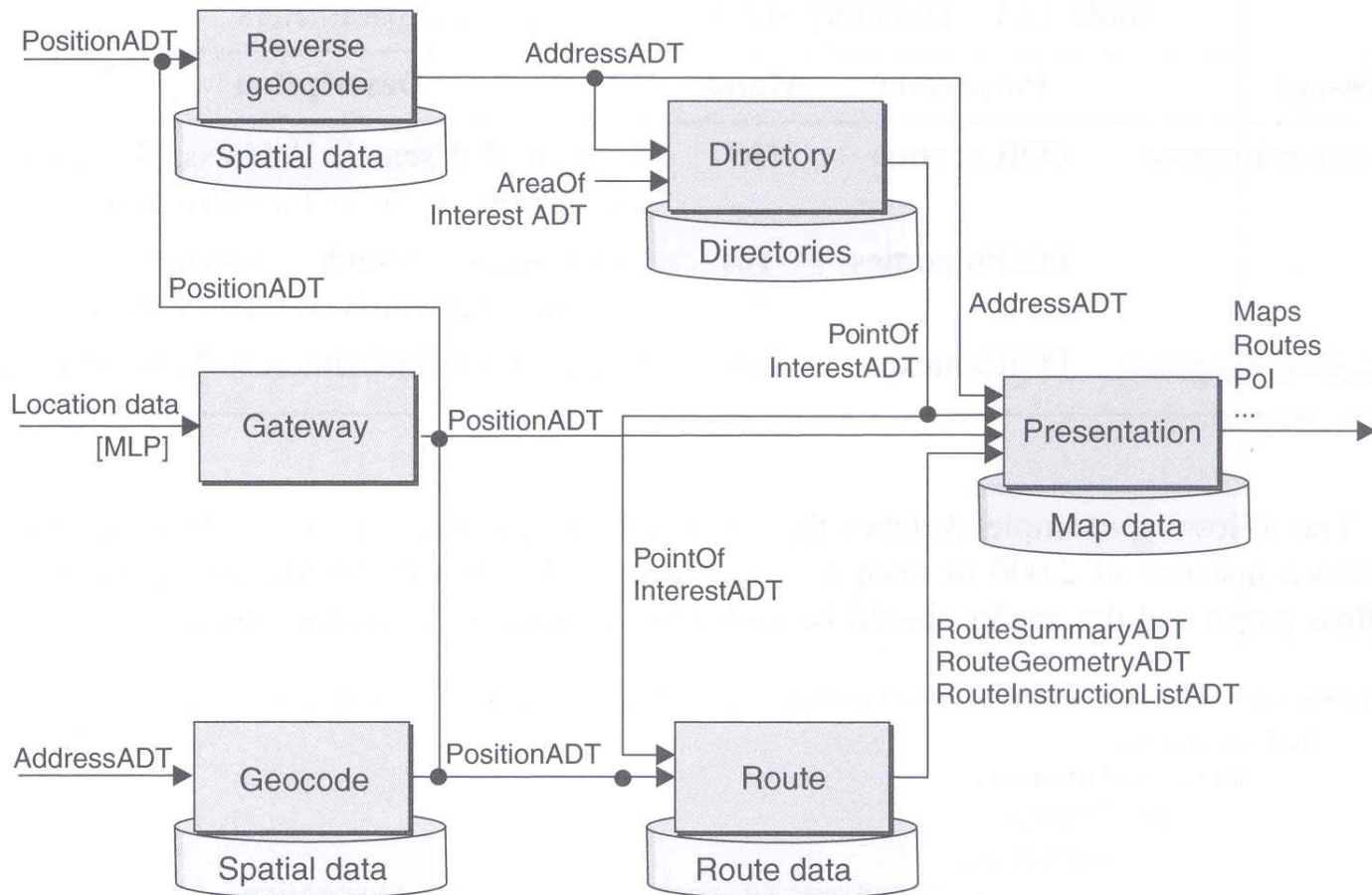Figure 12.7 OpenLS information model.

12.3.2 Core Services

12.3.2.1 Directory Service

Table 12.1   Directory service – messages and parameters

Message	Parameter	Mand.	Description
DirectoryRequest	POILocation	No	Type of POI search: Address, WithinDistance, Nearest, or WithinBoundary.
	POIProperties	Yes	Determines search parameters, for example, keywords or type of POI.
DirectoryResponse	POIContext	No	Contains a PointOfInterest ADT element.

12.3.2.2 Gateway Service

12.3.2.3 Location Utility Service

Table 12.2   Location utility service – messages and parameters

Message	Parameter	Mand.	Description
GeocodeRequest	Address	Yes	Carries one or several Address ADT elements to to be transformed.
GeocodeResponse	GeocodeResponseList		Delivers a list of elements, each embedding an Address ADT element and the associated geographic position as `<gml:Point>` element.
ReverseGeocode-Request	Position	Yes	Position ADT element to be mapped onto one or several addresses.
	ReverseGeocode-Preference	No	Describes the type of desired return parameters in terms of street address, postal code, building, etc.
	SearchArea	No	Geographic area according to AreaOfInterest ADT in order to narrow down or widen the search area specified by position.
ReverseGeocode-Response	Address	Yes	Reverse geocoded address as Address ADT element.
	Point	Yes	Exact geographic position of returned address.
	SearchCentreDistance	No	Distance of point from position specified in the request.

12.3.2.4 Presentation Service

Table 12.3   Presentation service – messages and parameters

Message	Parameter	Mand.	Description
GetPortrayMap-CapabilitiesRequest			Used to request the features supported by the presentation service.
GetPortrayMap-CapabilitiesResponse	AvailableSRS	Yes	List of source reference systems supported by the implementation, e.g. UTM.
	AvailableLayers	Yes	List of supported basemap layers, e.g. road networks, public transportation, etc.
	AvailableFormats	Yes	List of supported mime-types for encoding maps, e.g., image/png, image/gif, etc.
	AvailableStyles	Yes	List of available styles for map creation, e.g., Victorian, postmodernistic, etc.
PortrayMapRequest	Output	Yes	Carries the desired map attributes and determines the geographic area to be covered.
	Basemap	No	Specifies the desired basemap layers.
	Overlay	No	Specifies one or several desired overlays by means of the Location ADT or RouteGeometry ADT.
PortrayMapResponse	Map	Yes	Describes attributes of a generated map and provides an URL the map can be downloaded from.

12.3.2.5 Route Service

Table 12.4   Route service – messages and parameters

Message	Parameter	Mand.	Description
DetermineRoute-Request	RoutePlan	Yes	Defines criteria for the creation of routes. Contains elements for defining waypoints and to determine whether to calculate the shortest, fastest, and the least-traffic route and the preferred mode of transport.
	RouteHandle	Yes	Contains a reference to a previously determined route.
	RouteInstruction-Request	No	Used to request the delivery of turn-by-turn instructions.
	RouteGeometry-Request	No	Used to request the return of the route geometry and related parameters.
	RouteMapRequest	No	Used to request the delivery of a route map and its desired parameters.
DetermineRoute-Response	RouteHandle	No	Contains a reference handle to the route at the application server for referring to it in subsequent requests.
	RouteSummary	Yes	Summarizes the main route characteristics in terms of expected traveling time, total route distance, and other parameters.
	RouteGeometry	No	Contains the route geometry as a polyline as `<gml:LineString>` element.
	RouteInstruction-List	No	Provides turn-by-turn instructions.
	RouteMap	No	Delivers references to route maps stored at the server as well as map parameters.

12.4 Conclusion