The Purpose of

Geospatial Fusion Services

### An Open GIS Consortium (OGC) White Paper

In recent decades, large organizations such as government agencies have accumulated huge amounts of electronic data. The purpose of GFS is to enable linking and analyzing of those data collections based on their Geospatial content.

Non-map information - text, video, audio, digital photographs, mpeg movies, sensor data, word processing documents, etc. - often refers to place. It would be useful for many people in many situations to be able to "fuse" information such as addresses, place names, coordinates, pinpoints on photographs, and descriptive directions into one information management framework that would support search and discovery of spatial information stored in non-map formats. This is the goal of OGC's "Geospatial Fusion Services (GFS)".

OGC uses the word "fusion" to refer to a way of describing explicit relationships between geographic features that are somehow the "same" but described differently and perhaps presented in different media. Until now, there has been no standard way to do this. Geospatial Fusion Services

Why Geospatial Fusion Services?

- Analysts flooded with information from multiple sources.
- Geospatial Fusion Services help analysts understand spatial patterns.
- Find relationships in space and time, understand connections.
- GFSPP System is a set of tools based on open specifications to do that.
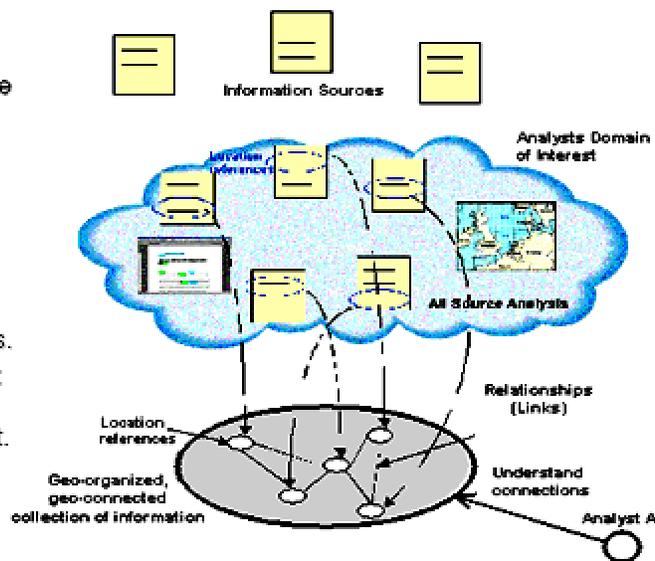
(GFS) refers to online services that provide this capability using standards developed in OGC.

This work will have implications for almost everyone who uses the Web in the next few years. As geospatial services based on GFS begin to appear commercially, we will see spatial capabilities in new information services of different kinds, providing easy access to all kinds of information about places, and information about things or people at a particular place.

OGC's testbeds, such as the Web Mapping Testbeds (WMT-1 and WMT-2), are organized for rapid development of open interfaces and protocols that enable interoperability. As in "rapid prototyping" engineering, these testbeds are very focused, short-term, hands-on cooperative development activities. In OGC's testbeds, candidate specifications are developed by multi-vendor teams of engineers as they work together to make the vendors' systems interoperate. The WMT-2 and GFS testbeds, the main focus of OGC's Interoperability Program 2000, added important new elements to the interoperability infrastructure that has been developed in OGC over the past seven years. OGC's Interoperability Program home page URL is http://www.opengis.org/.

From June 2000 to Jan 2001, the GFS team worked to develop a standard Web-based framework to integrate various kinds of text information, such as E-mail, newsletter, word processing documents and ASCII files gathered from many different sources. Future GFS efforts in OGC will enable similar integration and linking of satellite images, aerial photos, mpeg movies, and so on. OGC's GFS Testbed project (GFST) has produced candidate standard specifications for open interfaces and protocols that support such fusion.

Geospatial Fusion Services (GFS)

¥ Developed news ways to understand relationshipsÉ
¥ CY2000 GFS Testbed Ğ Four Specs
¥ 1Q2001 GFS Operational Prototype
¥ 3Q2001 Ğ Next Stages underway

Candidate OpenGIS® Specifications Developed in the GFS Testbed, and the Functions they Perform

The GFS Testbed ran in parallel with OGC's Web Mapping Testbed Phase 2 (WMT2), and there was significant cooperation between the two efforts. The candidate OpenGIS Interface Specifications developed in WMT2 and the GFS Testbed are under review by the OGC Technical Committee and are available as discussion papers at http://www.opengis.org/techno/discussions.htm. Those draft specifications most closely associated with the GFS Testbed include:

- Location Organizer Folder Specification. Application schema specification for encoding feature collections using Geography Markup Language (GML). The LOF also holds the relationships between features, bridging the differences between coordinates, addresses, place names, and so on.
- Gazetteer Service Specification. Service interface specification for transforming place names to geometry with respect to a coordinate reference system. This is a specialization of WFS (Web Feature Server) for hierarchically organized collections of features.
- Geoparser Service Specification. Service interface specification to parse location and event references from text messages (cable and news reports) based on specified target vocabularies. The object is to create explicit relationships between references to features in different contexts, or references using a different vocabulary or language.
- Geocoder Service Draft Candidate Implementation Specification. Service interface specification to transform locations in a named reference system (e.g., address, landmark) to location (i.e., a feature with geometry) in a coordinate reference system. Allows for a request providing a partial address, and the return of a complete address along with a geometry (usually a point relative to a requested SRS.)
- Basic Services Model. Encoding specifications for representing services metadata, service capabilities and service interfaces. In an operational BSM environment, one could use this encoding for platform and implementation independent discovery and access and application of loosely-coupled distributed services.
- Web Map Server. The WMS returns an "image," that is, an array of pixel values ready for portrayal.
- Web Coverage Server. The WCS, by contrast, returns a collection of vectors that inform the client of values of interest, such as temperature, ownership, average rainfall, and so on.
- OpenGIS Web Feature Server Specification: Service interface specification for accepting spatially enabled SQL-like query requests and responding with GML feature collections.
- Styled Layer Descriptor. An XML encoding specification for associating cartographic symbols with properties of features.
- XML for Imagery and Map Annotations. provides a GML syntax for representing textual and graphical annotation of images and maps
- High-Level Ground Coordinate Transformation Interface. The high level ground coordinate transformation service specification will provide a simpler set of parameters and coordinate systems that suffice in the vast majority of applications.
- Web Registry Server. Users need a registry of parameters, for example, for converting Mercator to Lambert, using specific datums etc. This service on the web will accept a request for these parameters and issue them along with information about the confidence we can have in these parameters.

Spatial and attribute data used by the system
The system can use any kind of spatial and attribute data.

GFST Sponsors and Participants
In-Q-Tel sponsored the GFS Testbed project, providing requirements (specific goals) and funding. Private sector technology provider participants in the GFS Testbed included Autometric (USA), Compusult (Canada), Cubewerx (Canada) , ESRI (USA), Galdos (Canada), Geodan (Netherlands), Intergraph (USA), IONIC (Belgium) , Laser-Scan (UK), Lockheed-Martin (USA), MapInfo (USA), ObjectFX (USA) , Polexis (USA), SCO (Australia), SGT (USA), and SICAD (Germany).

The main users
Who can use the system? After the OGC Technical Committee and Planning Committee

have voted to accept the candidate GFS specifications, they will become publicly available OpenGIS Specifications. They will be posted on OGC's web site (http://www.opengis.org). As vendors begin to offer products that implement these specifications, a list of these products will be available on that web site. Also, it is likely that extra documentation, sample programs, reference implementations, sample data, etc. will be made available on OGC's new OGCnetwork.org web site.

Any major organization with large quantities of spatially referencible information in different media and different formats will be a potential customer for software companies providing GFS solutions. In addition, there will be countless users of online services, including almost all of us. The standards produced in GFST will ultimately enable, for example, much more comprehensive searches based on location.

Note: All of the GFS interfaces are available on OGC's public site as Discussion Papers. It is expected that in late 2001 and early 2002, OGC members will be advancing these interfaces through the formal OGC specification process for approval as OpenGIS Implementation Specifications.