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The Earth to Business Company

Building a Geoportal

White Paper

ERDAS Inc. | 5051 Peachtree Corners Circle, Suite 100 | Norcross, GA 30092 | +1 770 776-3400 | Fax: 770 776-3500 | www.erdas.com

Building a Geoportal

Many countries have organizations responsible for collecting, surveying, processing, analyzing and publishing geospatial information (GI) for specified areas. In addition to national mapping agencies, there are numerous other administrative bodies of common interest available to all citizens: they manage the cadastre, road networks, waterways, or land occupation. They may also focus on a specific thematic domain, like monitoring natural resources as forests, preserved nature areas, etc. Moreover, numerous industries also own geospatial data that is vital to their activity: telecom operators, gas and electricity companies, transport and logistics companies, etc.

These organizations have an official mandate or simply a crucial need to make their data available to private or public users, individuals or organizations. Even within GI providers' own organizations, the necessity of efficient data circulation impels them to set up a powerful infrastructure for internally sharing the data.

GI providers take on the following principal missions:
1. Managing data and metadata
2. Delivering the data to external clients
3. Sharing the data within their organization
4. Managing user permissions
5. Allowing discovery of the data
6. Offering a web user interface

Managing data and metadata

GI providers collect, process, acquire and maintain the geospatial data critical to many business processes, inside their own organization and for external clients. These external clients include enterprises or government agencies:

- Real estate agents who need cadastre references of all the plots at a given distance of a main road
- Telecom operators who need to check the exact location of gas pipes before digging works
- Urban planners, monitoring plants of schools, malls, roads or tribunals in an area
- Ministries monitoring natural resources, agriculture, soil moisture, etc.

Geospatial data may be in a multitude of formats, depending on the application software with which it is collected, processed or stored. Heterogeneous data is often incompatible, preventing smooth mixing and sharing. This is the critical problem GI providers have to overcome.

Equally important as the data is the supporting metadata. The metadata allows efficient identification of the data via specific queries. The data sets of GI providers may reach terabytes in size, so the user must be guided to retrieve the data that meet his needs.

There is mandatory metadata, including the scale, geo-referencing, date and some basic keywords. Without this information, the data is simply unusable. Additionally, some optional metadata can enrich the description of the data. The GI provider may also need customized metadata, making sense to some users. The richer and more comprehensive the metadata, the more relevant the results of the search will be.

Delivering the data

Until recently, GI delivery always implied non-dynamic media: paper, fixed electronic media (like CD-ROMs and DVDs) or network-based electronic media (FTP downloads). Whatever their nature, these media always presented serious drawbacks. First, distributing geospatial information on fixed media necessitates the replacement of the medium, even if only a small portion of the data has actually changed.

Indeed, some geospatial data are subject to rapid changes. Yet it is crucial for users to access valid, up-to-date data. To cope with the dynamic nature of data, GI providers have to be equipped with an effective update capability, supporting changes that may occur at any time. Quickness of update delivery is essential: in many cases, it is precisely when changes occur that users need the data, for example, in a disaster situation.

Fixed media also complicates the management of licenses and usage rights applying to the data. For each different type of user, a different set of data has to be created and apposed onto the diffusion media, creating a distinct distribution channel for each type of user. Specific format conversions requested by some users can even make this split grow exponentially.

Such a cumbersome process is naturally error-prone. Moreover, it is time-consuming: there is always an operational delay to print or burn the data on the medium, and ship it to the users, making real-time or nearly real-time dissemination of GI unfeasible. Finally, overall accuracy of the data is threatened because outdated versions of the data may keep on circulating and be mistakenly used as current data.

All these drawbacks require GI providers to set up an infrastructure without fixed media, oriented towards real-time user rights management and dynamic data delivery.

Sharing the data

GI organizations, especially at the national or even international level, are usually complex, with teams spread over several locations. In Europe, the national organizations surveying the forests are grouped into a pan-European forest monitoring organization, which aggregates all the national contributions. Technology differences frequently complete the picture of geographic dissemination. Remote offices may use different GIS software, saving their data in various formats and mapping information to different data models. These problems often increase the overall workload, requiring separate maintenance of legacy material for large organizations.

Although distance often separates multiple offices, these different sites must share their data together. Overcoming the technical hurdles is a daily challenge requiring many data conversions and custom mappings. In these situations, data is not truly shared; rather it is transported back and forth from one site (or team or office) to another, undergoing many conversions and replications. At some point, the valid, most up-to-date data is located in a single place. In the other locations, the data is either already outdated, or not yet received.

While this scenario frequently occurs, real data share enables the simultaneous availability of the unique current version of the data, everywhere within the organization, so that anybody is able to update their own data at any time, without disrupting the global service continuity. What GI organizations need is an infrastructure where all the pieces are compatible throughout processing, so custom conversions are cancelled or drastically reduced. This can be achieved through interoperability: a common infrastructure based on open standards ensures a direct, smooth workflow, making all the sites of the GI provider's organization effective, accurate and responsive.

Managing user permissions

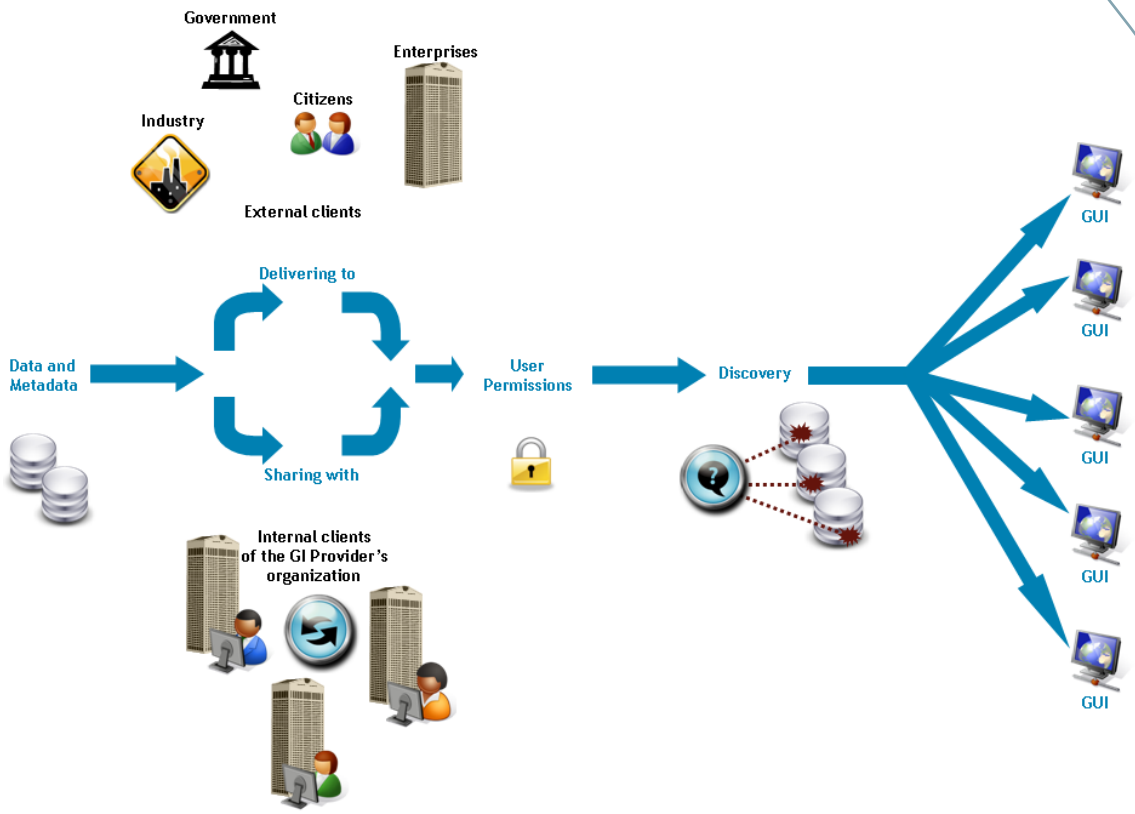
An essential element for GI providers is the diversity of the potential users or clients. A national mapping agency, for instance, has to serve data to other official administrations, local territories and regions, and to citizens and enterprises. Depending on the requesting user, the data delivered by a national mapping agency won't be the same. The visualization of military zones is a typical example of geospatial information with the visualization restricted to some authorized users only.

The variety of types of users compels GI providers to implement strict security rules, guaranteeing that classified, private or licensed data is not distributed to non-entitled users. Since the type of user implies restrictions on the set of data that can be made available, GI providers have to display the viewing options available to their diverse clients. Therefore, any automated infrastructure/system for GI providers must be both adaptive and secure.

Allowing discovery of the data

While the GI provider's organization is often split over different locations and teams, they must be able to put a centralized offer on the market. Indeed, for the end-user of the geospatial information, the organization's scattering must remain invisible: the catalog of available data and services should appear as a unique merged catalog, hiding the complexity of the federation.

For a catalog of geospatial data and/or services, today's market place expects more than just a list of available resources. Indeed, users must be guided through the catalog, to discover which data exists and which ones meet their individual needs. An efficient catalog must provide a useful description of the data it references, and a flexible search functionality. A single entry point and multiple search paths (using keywords and various criteria) will allow optimal usage of the data.



The six challenges of GI providers

Offering a web user interface

Growing market demand, requesting real-time access to ever-changing data throughout the world has prompted GI providers to make their data available over the Internet.

Geographic data is complex, and the way it is presented must be understandable and exploitable. GI providers' clients demand a user-friendly interface, proposing intuitive commands with graphic sophistication to facilitate visualization. Clients also want the interface to fit their own business case, in terms of data relevancy and functionalities. Finally, continuous adaptation to changing business cases is a reality that GI providers have to tackle.

To modify user interfaces at any time and customize them in detail, GI providers need efficient tools. Re-usable independent components that can be mixed in unnumbered combinations help GI providers to offer user interfaces that fulfill their clients' business cases, in a flexible and cost-effective way.

In summary, GI providers face six main challenges:

1. They create and maintain geospatial data and metadata.
2. They have to deliver this data to their external clients, in real-time and independently from the software they use.
3. They have to share this data with their internal clients (or "sites").
4. They must ensure proper use and security of their data, managing the permissions of the users.
5. They must provide a discovery facility to their clients, allowing them to identify which data meet their needs.
6. They have to provide an interface offering a dedicated solution to the particular business cases of external or internal clients.

What is an ERDAS Geoportal? What are the principles of it?

A geoportal offers the GI provider's internal and external users the ability to securely search, discover, access, visualize and even update geospatial data and services, online and in real-time, via a customized web user interface.

The main obstacle encountered by GI providers for making their data widely available is the diversity of their formats. A geoportal built with ERDAS APOLLO overcomes this problem by abstracting all possible data formats into a single generic model. This abstraction is performed by OGC/ISO standards-based web services, which can expose initially heterogeneous data. Then, any data can be combined, visualized, overlaid and analyzed together. The geospatial intelligence is located in the web service.

For the web service user, the complexity of the data is greatly simplified. When making a request to the web service, he or she does not need to take the technical characteristics of the data into account (the web service does this). With OGC/ISO standards, interoperability is implemented—initially incompatible data can now be seamlessly combined.

In addition to web services, ERDAS APOLLO relies on a catalog aggregating all the metadata associated to the data. The catalog itself is a service that is able to retrieve the data of which the metadata match the search criteria. The catalog allows the user to find data relevant to his or her business needs complementing the web services.

The geoportal's visible part for the user consists of a web graphical user interface, able to send queries to the web services and catalog, and receive and display their responses.

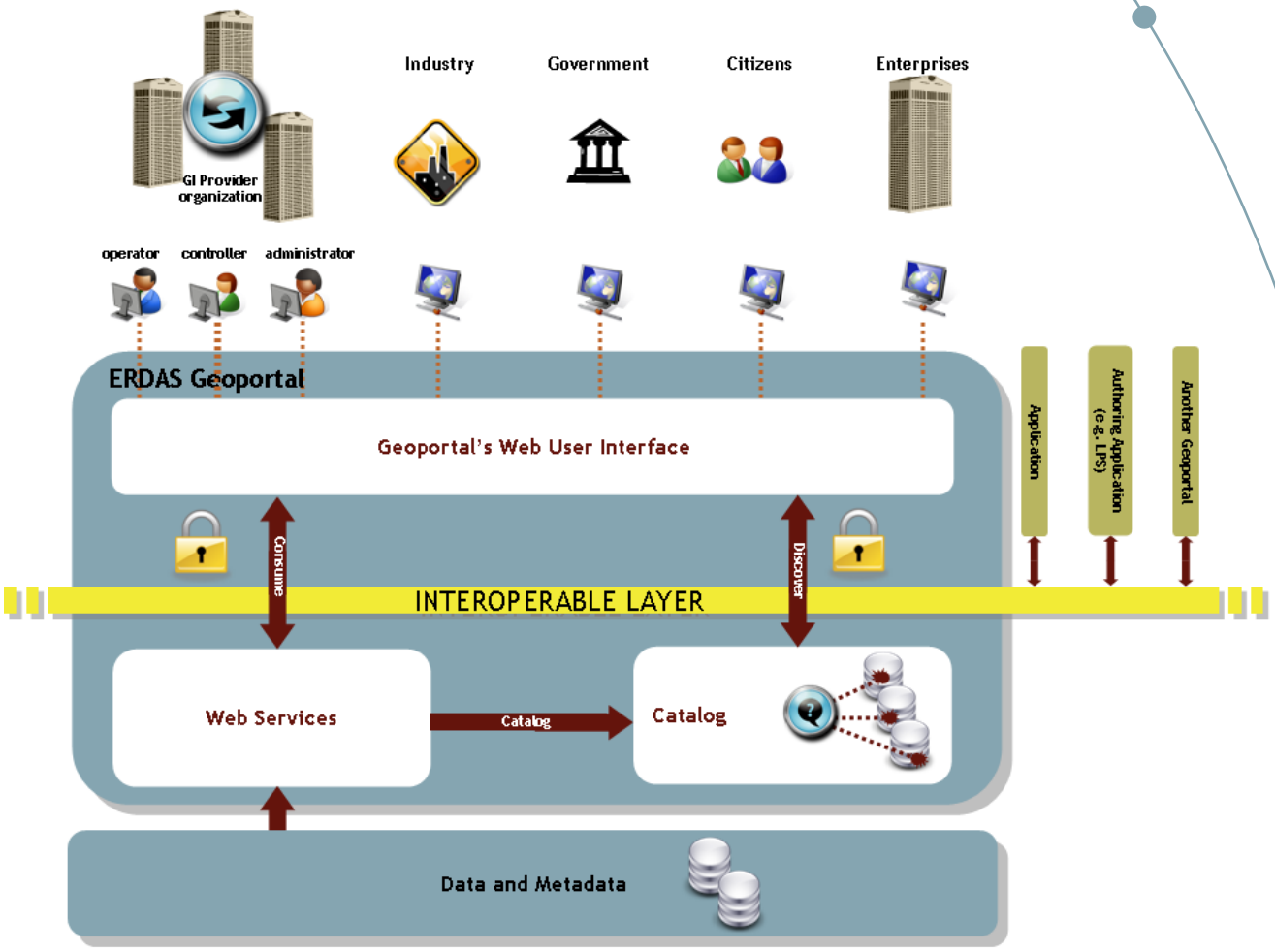
The web interface authenticates the user, to deliver only the data the user is entitled to access. The GUI presented to the user may also be dependent on identification.

External applications other than the GI provider's geoportal web interface may also connect to the interoperable layer above the web services and the catalog. This may include other geoportals, incorporating external data sources to their own offers, or business applications integrating geospatial data into their workflow. This is made possible by the interoperability achieved by the web services, based on open standards. The interface offered to the external world is completely vendor-independent.

What are the benefits of building a geoportal using ERDAS APOLLO?

Built with ERDAS APOLLO, a geoportal brings GI providers the following benefits:

- The fastest and largest diffusion
- Full interoperability, including with external partners
- Unparalleled discovery functionality
- Flexibility and adaptability to a variety of users
- Cost-effectiveness



The Geoportal Solution, supported by web services and a catalog

Fastest and largest diffusion

Delivered over the Internet, accessible from anywhere and to anybody, the value of the GI provider's data is maximized. Data are not just "transported" over the Internet; they are presented by web services, delivering the data with flexible options and functionalities. Users do not need to have anything installed on their computer; only a web browser is necessary. Licensing rights are managed securely and dynamically. Based on the user's authentication, the geoportal only delivers the authorized data.

Web-based delivery and Service Oriented Architecture (SOA) relieve GI providers from the fixed media system, allowing faster and easier updates and maintenance. Moreover, distributing data over the web increases the data's safety and consistency: the risk of disseminating physical data is considerably reduced, minimizing the occurrence of conflicting versions of a given data set.

Data can be centrally hosted or scattered across the organization. For the external clients of the GI provider, the data can be viewed, in any format, in their latest version, at any time. For the GI providers' internal clients potentially spread over different

locations, the same principle applies: data can be accessed, processed, updated at any time, from any location, without replications and custom conversions.

Interoperability

The web services abstract the heterogeneous data to a generic model, which is based on open standards. This means that both the ERDAS geoportal and any other open standards-compliant application can access these web services.

Interoperability allows GI providers to initiate partnerships with other data providers, enriching their geoportal's offer at any time with new data and services. Integration of new partners in the existing geoportal is done seamlessly: thanks to the open standards compliance, both the GI provider and its partners transparently speak the same language.

Discovery

A geoportal generally provides data from different actors – multiple sites of the GI providers or even external partners. Whatever the quantity of data sets, ERDAS APOLLO offers a centralized generic catalog, allowing users to discover the complete range of available data.

Structured and unstructured access to the data is possible. If the user knows what they are looking for, they will find the data in the catalog under its unique reference. If the user does not know which data meet their needs, they can explore several search paths, using keywords and/or various criteria (e.g. area of interest, time stamp, data accuracy, measure type, etc.) to eventually discover data.

While the data referencing is concentrated in a unique catalog, the data and metadata are still owned and maintained by their respective owners. The logical structure of the catalog is distinct from the actual physical data storage.

The user gets all the advantages of a federated catalog as a unique entry point to scattered data sets. Meanwhile, the GI provider still operates with remote sites and multiple data storage centers.

Flexibility and adaptability

The ERDAS geoportal can be customized to serve a GI provider's unique data needs. Each GI provider will have a different geoportal.

Moreover, the geoportal can adapt its behavior depending on the type of user, supporting custom data and metadata formats, management logic, graphical user interface, data presentation, styling, search criteria and language (internationalization). ERDAS APOLLO GeoPortal Toolkit provides a set of independent components, each implementing a possible functionality of the user interface. They can be blended into unlimited combinations, to create customized versions of the web user interface, with minor development effort.

Thanks to the user-friendly web interface supported by the interoperable web services, the geospatial data are no longer reserved for GIS experts who understand the technical complexity of multiple formats and can use specialized GIS software.

Geospatial data's usage suddenly expands from a small group of technical experts to virtually anybody.

Cost-effectiveness and return on investment

Building a geoportal with ERDAS APOLLO equips GI providers with a cost-effective infrastructure for sharing their data internally and externally.

Dematerialization is a source of important savings. Indeed, metadata are completely dematerialized and the data can be dematerialized if served by a web service. The production and logistics costs are thus drastically reduced. Data can also remain in physical resources like paper maps, where their production can be streamlined and organized on a just-in-time model.

Simpler data maintenance and storage also allows cost reductions. Indeed, the different data or services offered to the different types of users are dynamically managed and do not have to correspond to a partial replication of the data nor to different services. For example, the map visualization service (WMS) can restrict access to some layers to a particular category of users. This restriction is managed in real-time when serving the map to the user connected to the portal; there are not two different maps stored, making a significant difference when that map has to be updated. Requiring less time for integration and maintenance, geoportals built using ERDAS APOLLO ensure a rapid return on investment.

Furthermore, managing huge sets of data, GI providers are concerned about their long-term infrastructure strategy. It needs to support the evolution of the geospatial information market. A Strategic Member of the OGC, ERDAS not only provides open standards compliant solutions; but also commits to continue innovating as new standards are created.

Finally, the quality of service offered by a geoportal is superior to any comparable offline infrastructures with 24/7 availability, up-to-date information, diversity of possible portrayal settings, etc.

Conclusion

Acquiring and maintaining earth data is a costly endeavor, by which organizations establish solid assets. Transforming earth data into business information maximizes their value.

Geospatial data accessible via an ERDAS geoportal is exploited to its full potential, becoming the critical information on which enterprises can rely to complete their business processes and make enlightened decisions.

FEEDBACK

If you have any questions or comments regarding the content of this paper please contact:

Luc Donéa
ERDAS APOLLO Product Manager
Phone: +1 770 776 3400; Direct: +32 4 364 04 07
Fax: +32 4 253 47 37; E-mail: luc.donea@erdas.com