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GEOCLOUDS FOR ENVIRONMENTAL MANAGEMENT

**Evangelidis Konstantinos¹, Ntouros Konstantinos²,
Papatheodorou Konstantinos³, Konstantinidis Alexandros¹**

Technological Educational Institute of Kentriki Makedonia, Dept. of Civil,
Surveying and Geoinformatics Engineering, Terma Magnisias Str., 62124 Serres,
Hellas. Email: kevan@teiser.gr

1. Lecturer, 2. Research Associate, 3. Associate Professor



International Conference “New tools for sustainable management of aquatic living resources”





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Aim

- To identify the degree to which **Cloud Computing** capabilities suite to particularities, technical specifications and functional requirements of **environmental - related projects**.
- To standarize the involved spatial nature of environmental parameters according to the **Geospatial Web**





Cloud Computing...what is it

- Cloud computing is a **model** for enabling **ubiquitous, convenient, on-demand network access** to a shared pool of **configurable computing resources** that can be **released and rapidly provisioned** with **minimal management effort** or **service provider interaction**.



Image from:
<http://www.cpusage.com/>





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CC Essential Characteristics



**On-
demand
self-service**



**Broad
network
access**



**Resource
pooling**



**Rapid
elasticity**



**Measured
service**

[Image from: www.theworldstechnology.com](http://www.theworldstechnology.com)





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Cloud Computing Benefits



[Image from: www.geospatialworld.net](http://www.geospatialworld.net)





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Geospatial Cloud Computing -GCC

Has emerged due to the growing demand for cloud-based geospatial applications and platforms and refers to:

- Web-based **map browsers**
- **GPS** enabled **applications**
- in-car **navigation services**
- high resolution **Earth imaging systems**
- mobile smart phone **location applications**





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GCC for Environmental Management?

GCC capabilities may **assist** in the following aspects of **Environmental Management**:

- **Environmental Modeling**: complex geoprocesses on geospatial data from multiple sources requiring high performance computing platforms
- **Environmental Data Fusion**: location-referenced sensor data need to be combined (fused) with large data sets of traditional GIS data





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GCC for Environmental Management?

- **Data Mining:** information creation through sophisticated **data mining based on geospatial criteria**
- **Demand Management:** satisfy geoprocessing needs of a large number of users
- **Data sharing:** environmental maps sharing over the web.
- **Environmental data delivery:** environmental data delivery among different environmental projects

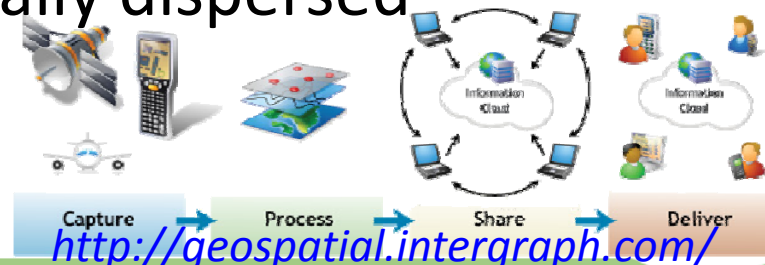




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GCC for Environmental Management?

- **Interoperability:** establishment of a common framework for environmental geospatial data and services
- **Security:** handle security issues relating to geospatial data exchange
- **Data Acquisition:** Collection of data sourcing from different automated spatially dispersed environmental sensors





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Geoclouds for Environmental Management

- The term **Geocloud** denotes the **Geospatial** aspect of Cloud Computing.
- In the present, the term “GEOCLOUDS” refers to **Standards**, **Services** and **Tools**, employed to support Environmental Management applications by using the “Cloud”





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Open Geospatial Consortium Standards

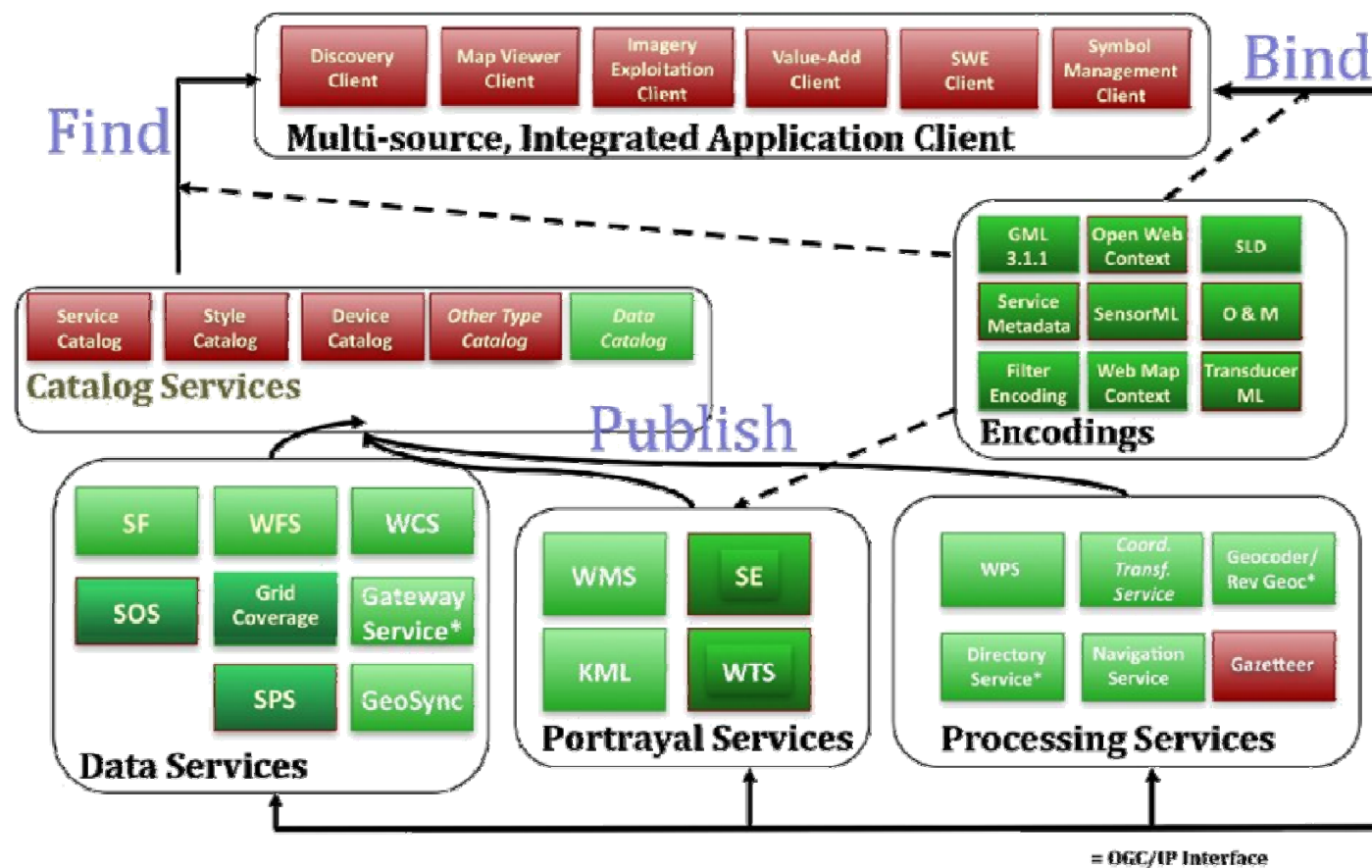
- **Portrayal Service:** Web Map Service (**WMS**)
- **Data Services:** Web Coverage Service (**WCS**)
Web Feature Service (**WFS**)
- **Processing Services:** Web Processing Service (**WPS**)
- **Catalogue Services:** CS Core





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Open Geospatial Consortium Standards



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GeoMetadata Management Tools

- **Data from different sources** either governed by or collected with or corrected and maintained under different methods, methodologies or assumptions...
...require advanced Metadata documentation!
- **Adopting a geospatial data tool** for metadata management (e.g. INSPIRE GEOPORTAL Metadata editor) **is a key action** towards a successful environmental project implementation





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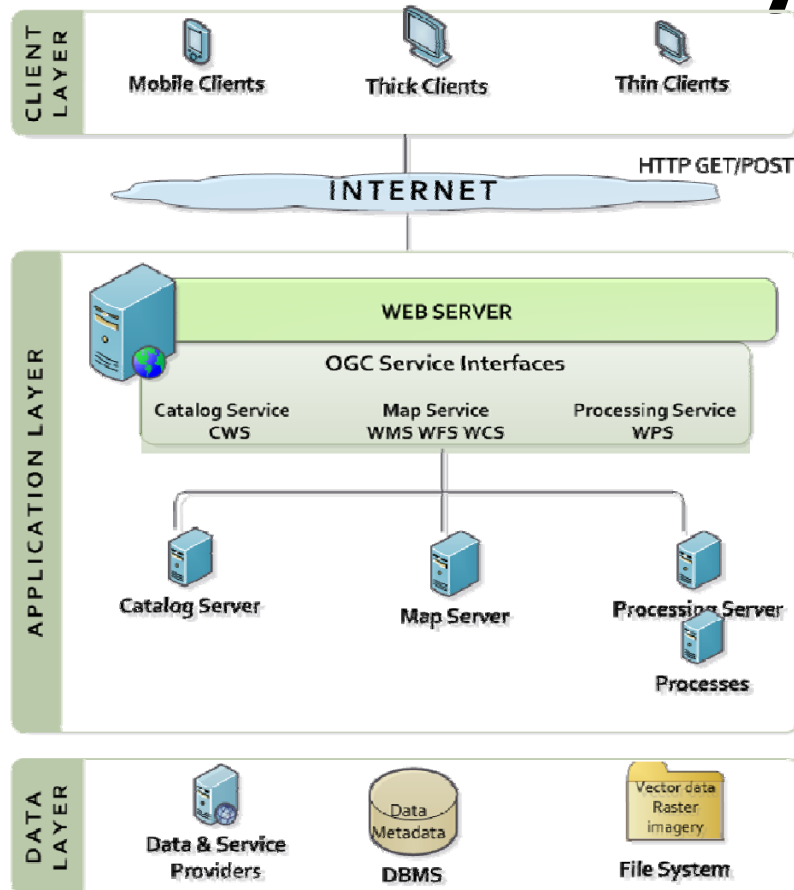
Interoperable Spatial Data Exchange formats

- For Systems deployed under different platforms and/or software components with different underlying data models, interoperability may be achieved through:
 - **XML based encodings for spatial data (GML, KML)**
 - **Other Web Semantic Standards for data interchange on the Web such as RDF**





Indicative System Architecture



In the **client layer**, appropriate Web Services satisfy end user interaction with the project

The **Applications Layer** contains the software and the appropriate services to provide users with the demanded functionality

Data Layer supplies the application layer with data in order to perform calculations and processes





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Conclusions-Further Developments

- Environmental Projects require **real-time and archived data processing, homogenization, remote access and management functionalities** provided by cloud computing.
- The spatial nature of environmental parameters combined with the penetration of **smartphones** and the **development of location-based services**, place Geospatial Cloud Computing as **the hot topic for state-of-the-art support of environmental management.**





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Conclusions-Future Developments

...may include, without being limited to:

- **specialised telematic apps**; for controlling hardware equipment based on alerts/triggers sourcing from environmental sensors
- **repositories in the Cloud**; connected with sensors dispersed around the globe providing real time environmental data and information
- real time and archived data from **fusion / combination / data mining**
- environmental-related **processes** offered through the cloud from specialized geoprocessing providers





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