ORACLE®

SPATIAL

May 2011

Oracle Spatial User Conference

ORACLE®

SPATIAL

Oracle Spatial User Conference

May 19, 2011

Ronald Reagan Building and International Trade Center

Washington, DC USA

May 2011
Oracle Spatial User Conference

Moser Wolfgang

Senior GIS Architect

Roberto Orsi

Product Manager

Nicola Giuliani

Project Manager

ORACLE
SPATIAL

May 2011
Oracle Spatial User Conference

new GIS

newGIS

Persistent Topology based System
to provide
Cartographic Transactional
Web Services
at the Province of Bozen, Italy

ORACLE SPATIAL
May 2011
Oracle Spatial User Conference

Agenda

new GIS

ABACO 20 years

trilogis

- Overview
  - History
  - Aims
  - Principles
  - Challenges
  - Results
  - Future
- Core & topology
  - The Story
  - The Project
  - achievements
    - The Basis
    - Locked Area
    - The Rules
    - Clone Simple Features
- Clients & Web Services
  - Types of Clients
  - Types of Web Services
    - Security
    - Meta information and data
    - External functionality

ORACLE
SPATIAL
May 2011
Oracle Spatial User Conference

new GIS

AUTONOME PROVINZ BOZEN - SÜDTIROL
Abteilung 9 - Informationstechnik
Amt 9.6 – Raumbezogene und statistische Informatik

PROVINCIA AUTONOMA DI BOLZANO - ALTO ADIGE
Ripartizione 9 - Informatica
Ufficio 9.6 – Informatica geografica e statistica

D E M O N S T R A T I O N

Overview

ORACLE SPATIAL
May 2011
Oracle Spatial User Conference

History

1990 1995 2000

ArcINFO
Coverage

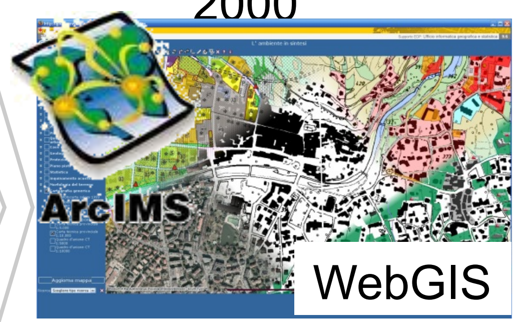
ESRI

ArcView
Shapefile

ArcMap ArcCatalog
ArcGIS

a few heavy applications
-> -> strong increase in width

2000 2005



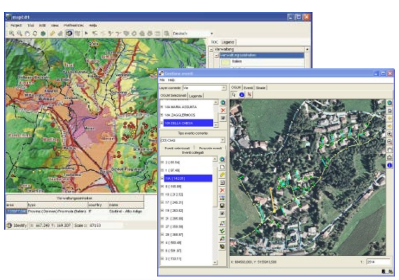
WebGIS

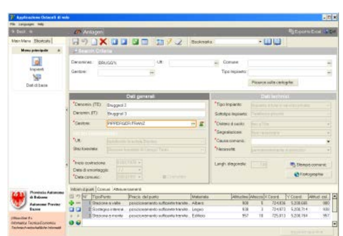
GB2UTM

ORACLE
ArcSDE

centralization, publication, simple editing

2004 2009





increasing demands for complex solutions

2010 ...

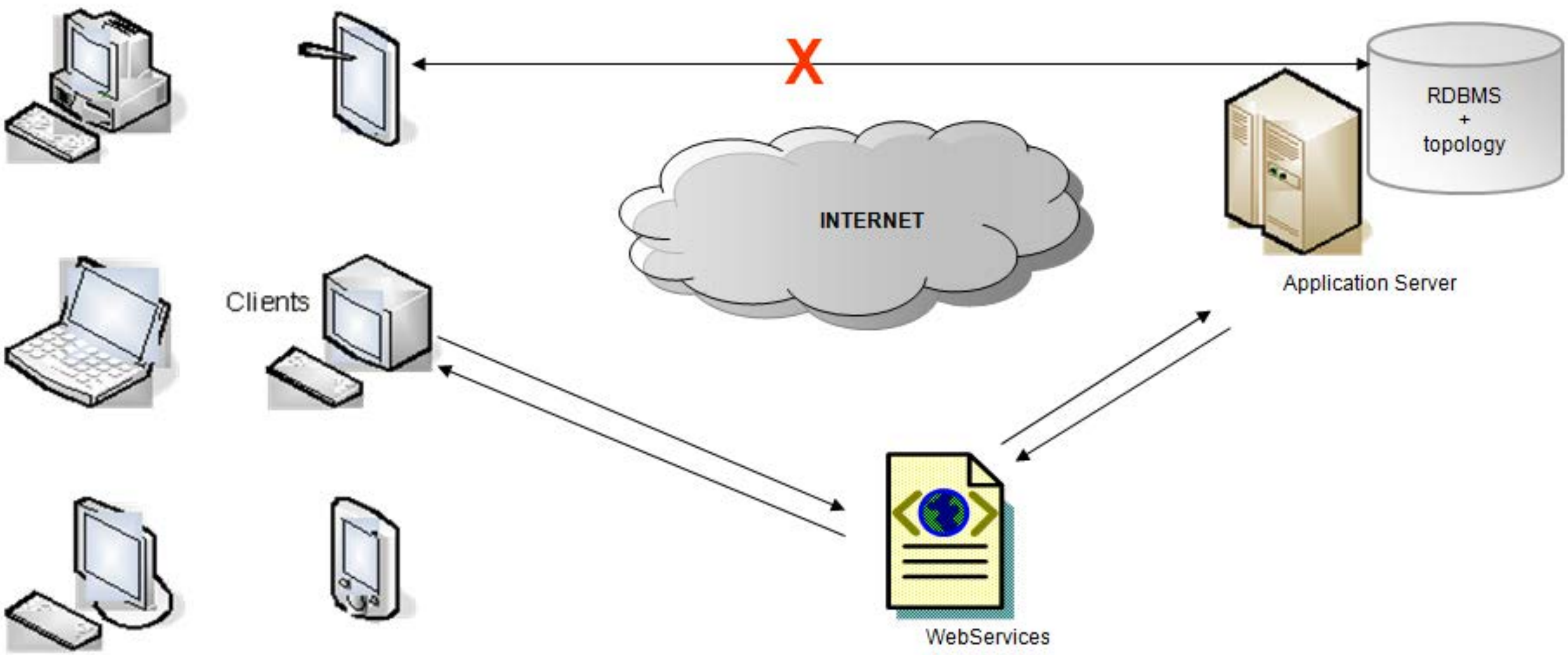
what we want:
- quality RDBMS
- open interfaces
- GIS Infrastructure
- freedom to go our way

spatial data Infrastructure, open standards, newGIS

Aims

- Full use of all aspects of high-quality database for GIS;
- GIS should become a service and not an increasing number of applications;
- Definition and control of rules in the server;
- Expandable system and controlled maintenance costs;
- Low costs for simple “standard” applications;
- Uniqueness of the geometric relations and ability to query them directly;
- Open interfaces to any specialist tools (…);
- Joint management of the geometrical and the traditional attributes of objects;
- Independence of applications from data storage;
- Standardization of communication interfaces.

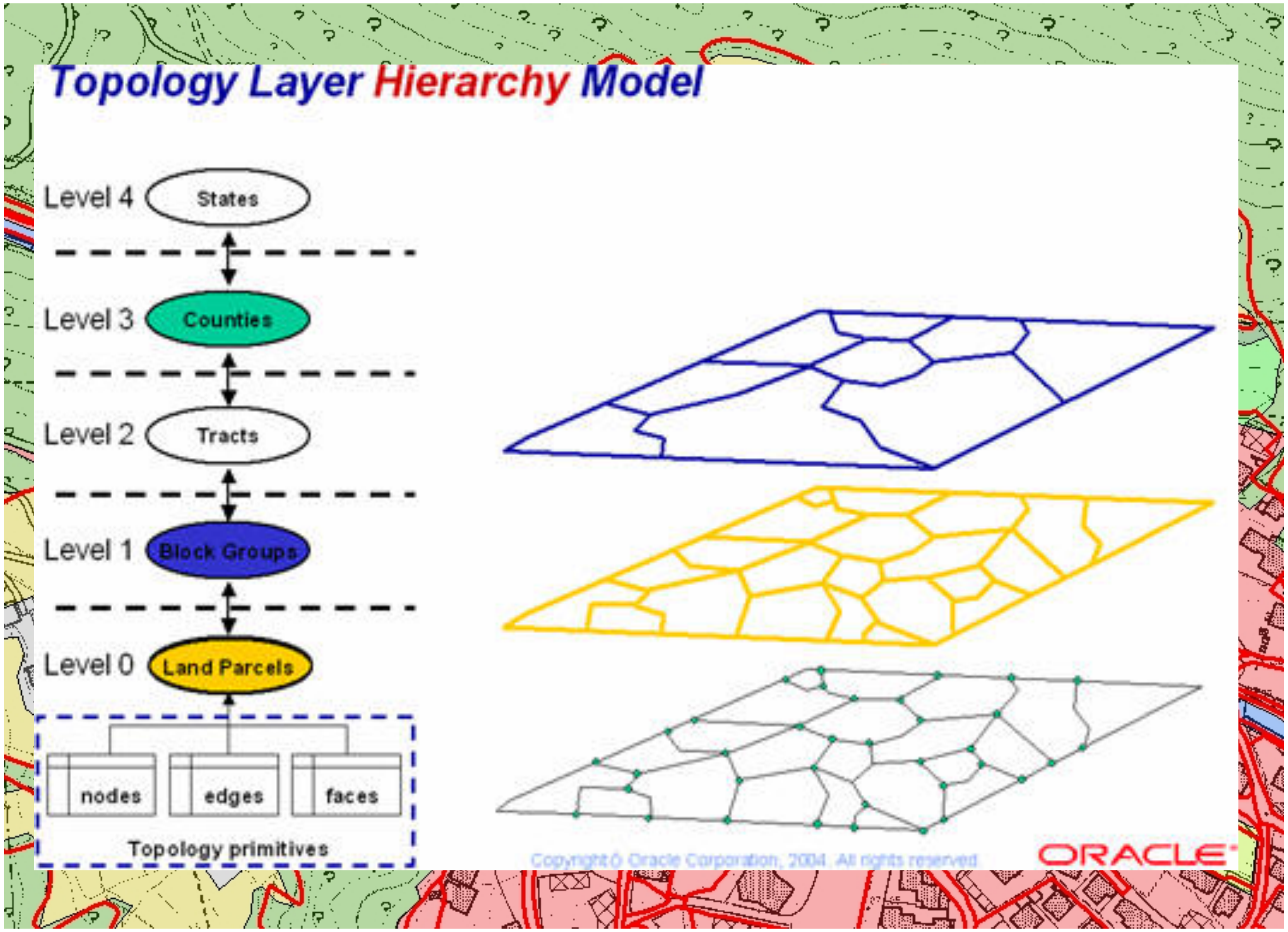
Principles


X
RDBMS
+
topology
INTERNET
Application Server
Clients
WebServices

Challenges

- What does GIS expect from persistent topology?
- Who is able to understand our aims and to reach the targets?
- What are the technical difficulties and imperfections we will encounter?
- The simplicity of the smart data model had also several implications.

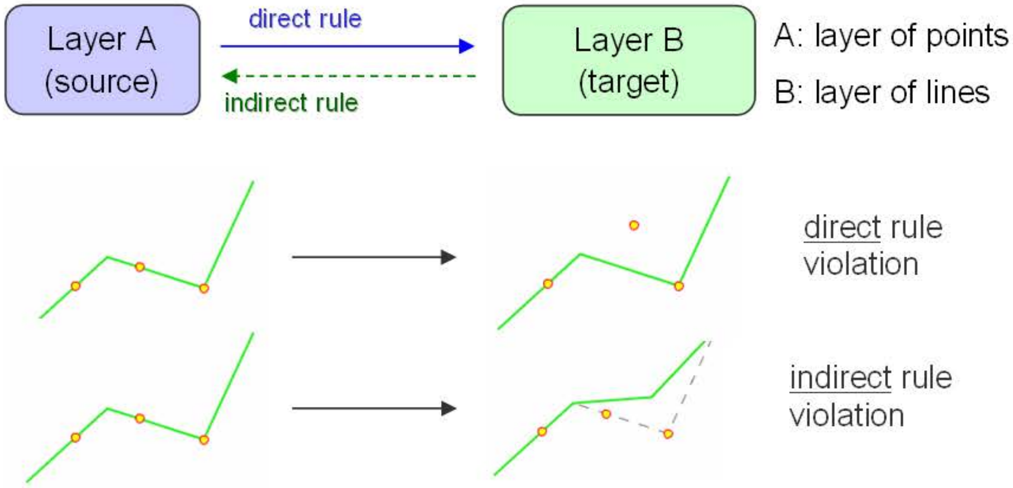
Challenges: Topology



May 2011
Oracle Spatial User Conference

Challenges: Topology

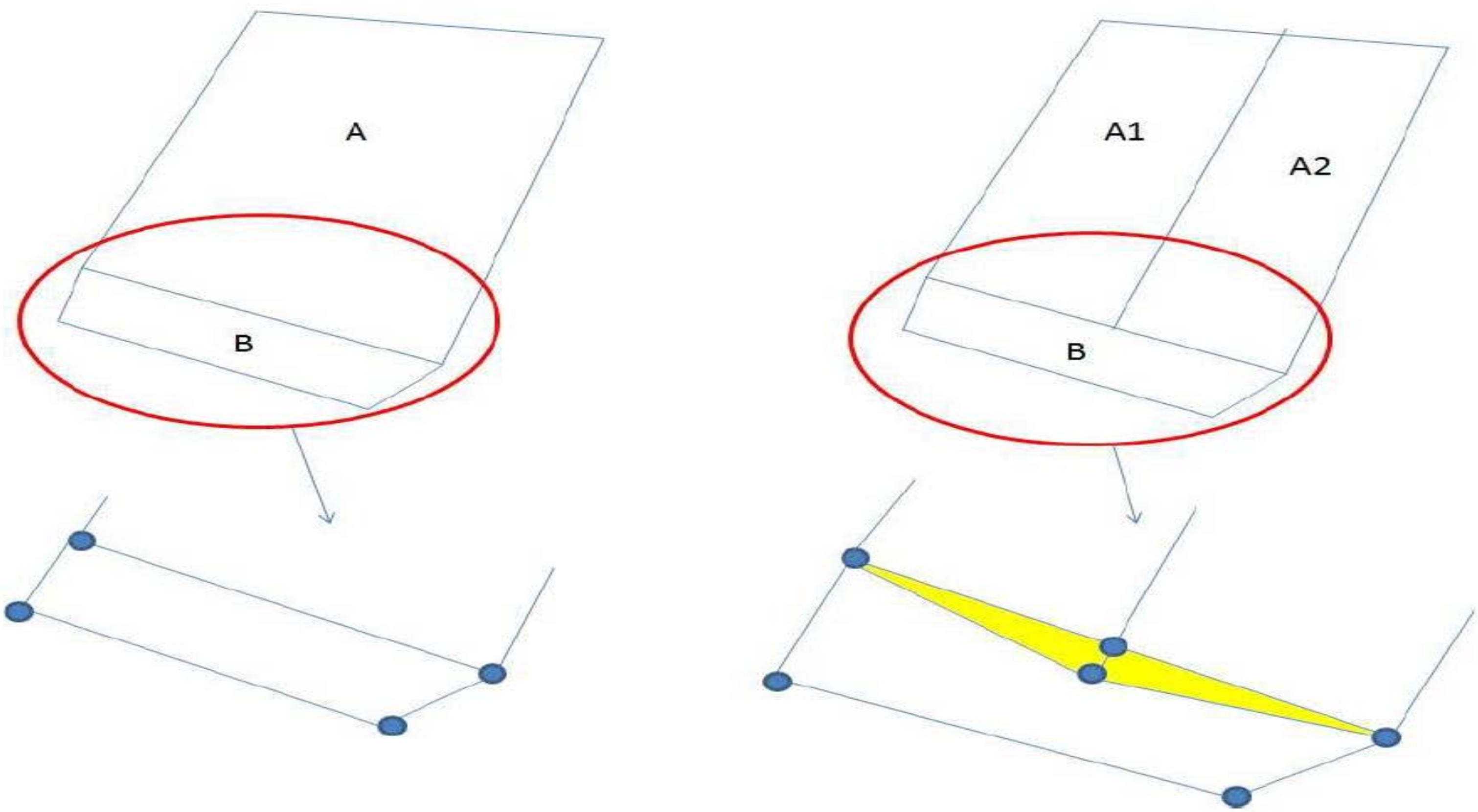
Rules
- within one layer,
- within one topological structure,
- within different topological structures.



- exactly or depending on tolerances?
- warranted by data model or by fat client?

May 2011
Oracle Spatial User Conference

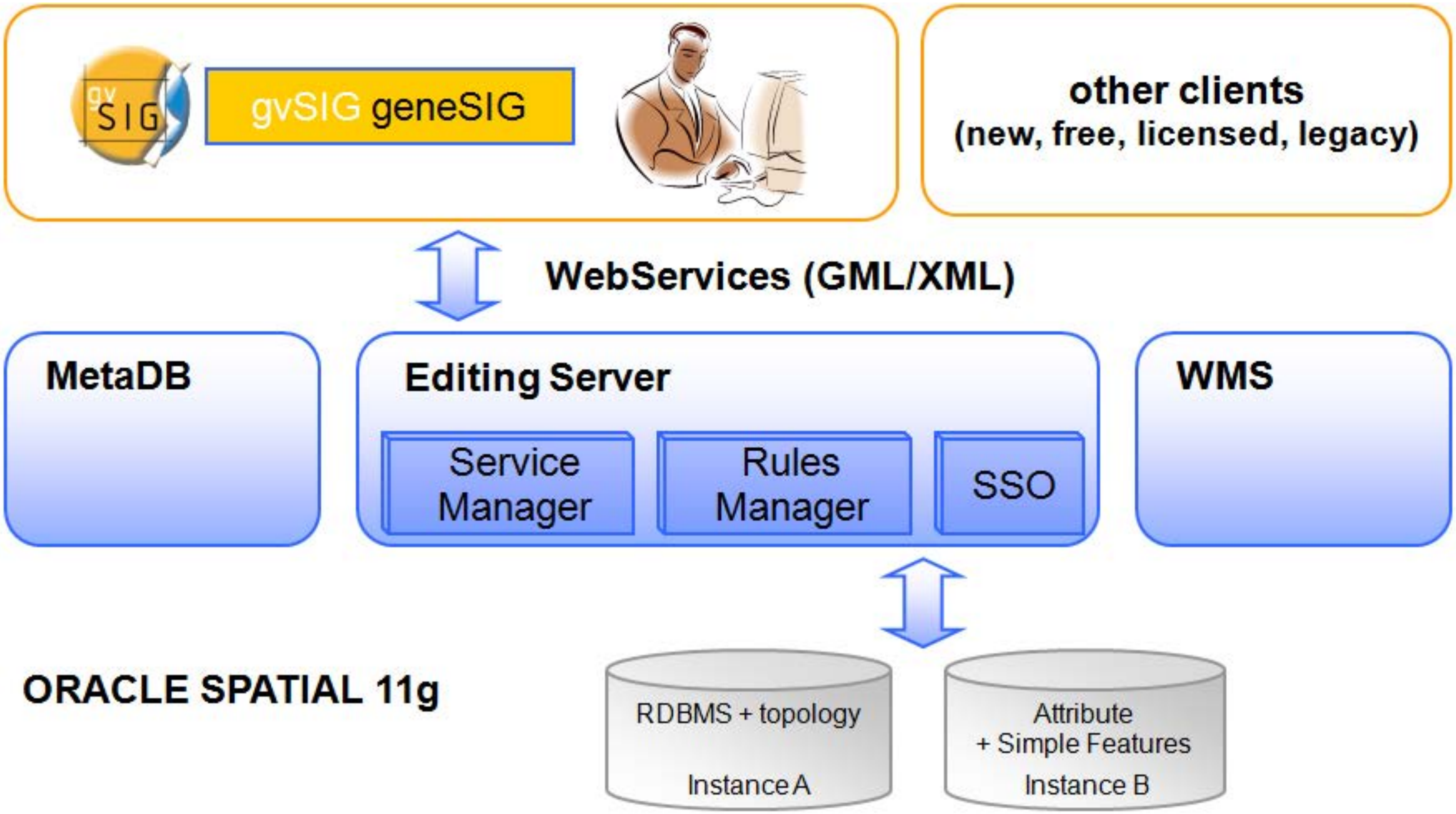
Challenges: Topology



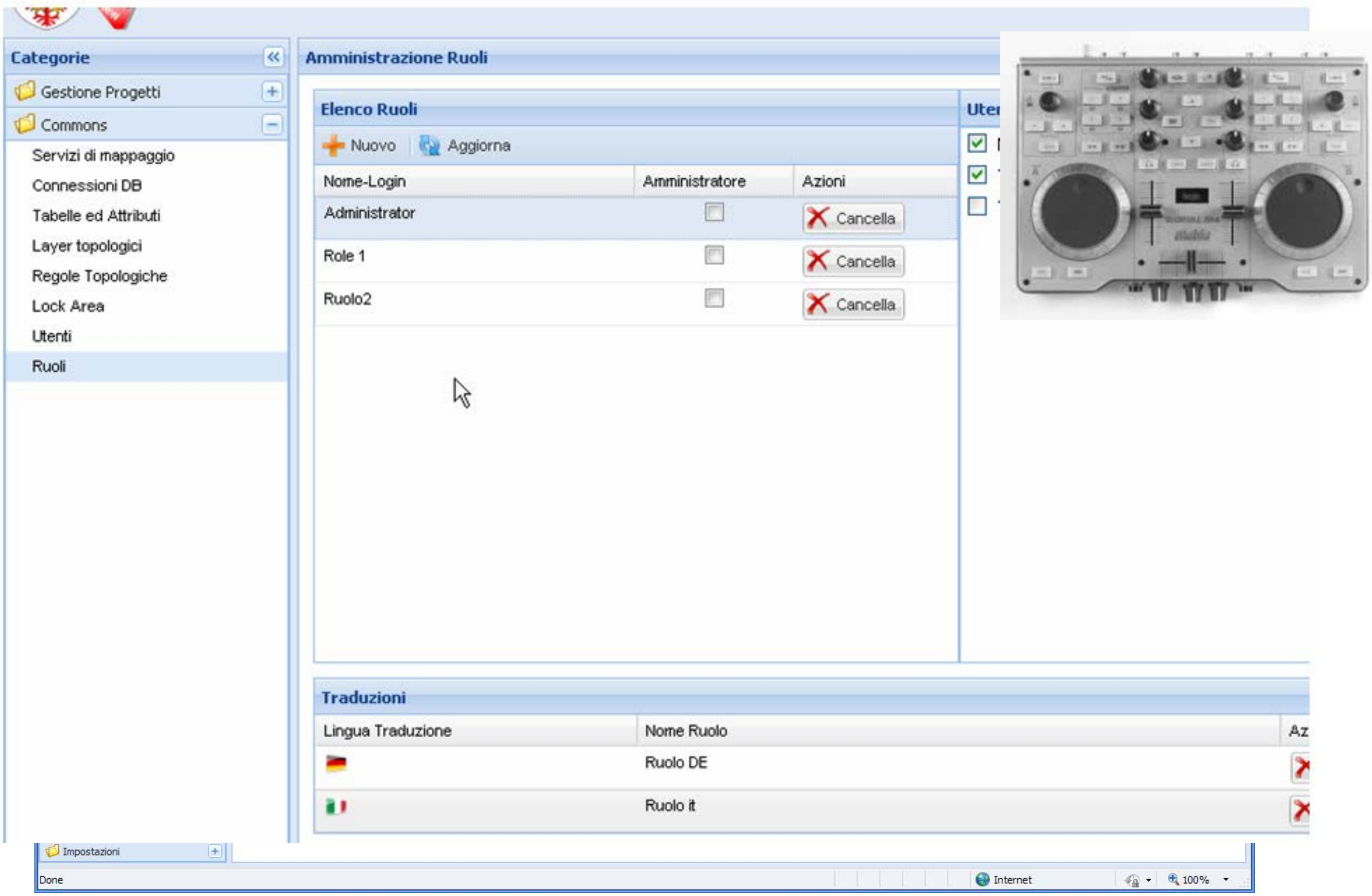
ORACLE SPATIAL

May 2011
Oracle Spatial User Conference

Results



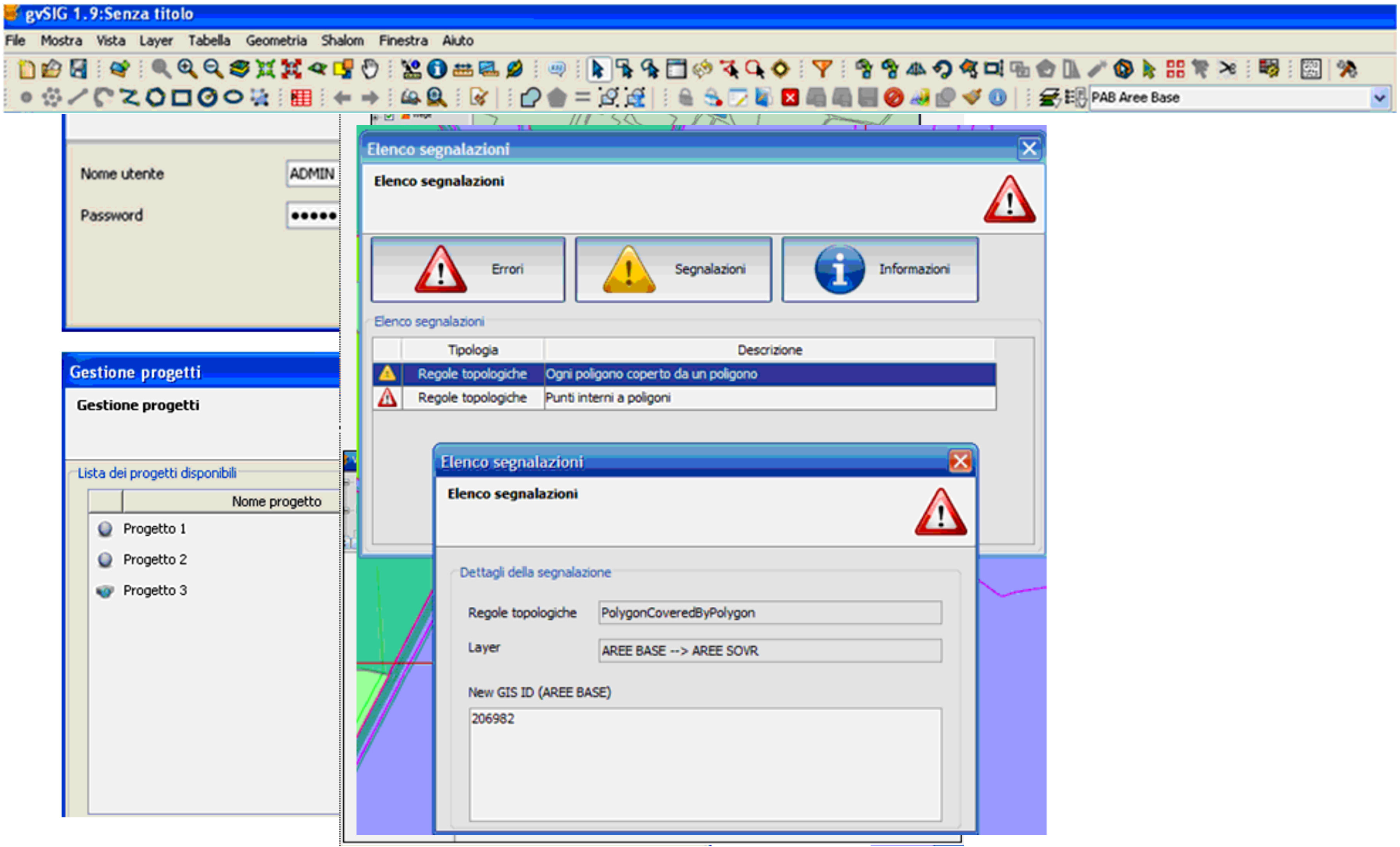
Results: Configurator



ORACLE SPATIAL

May 2011
Oracle Spatial User Conference

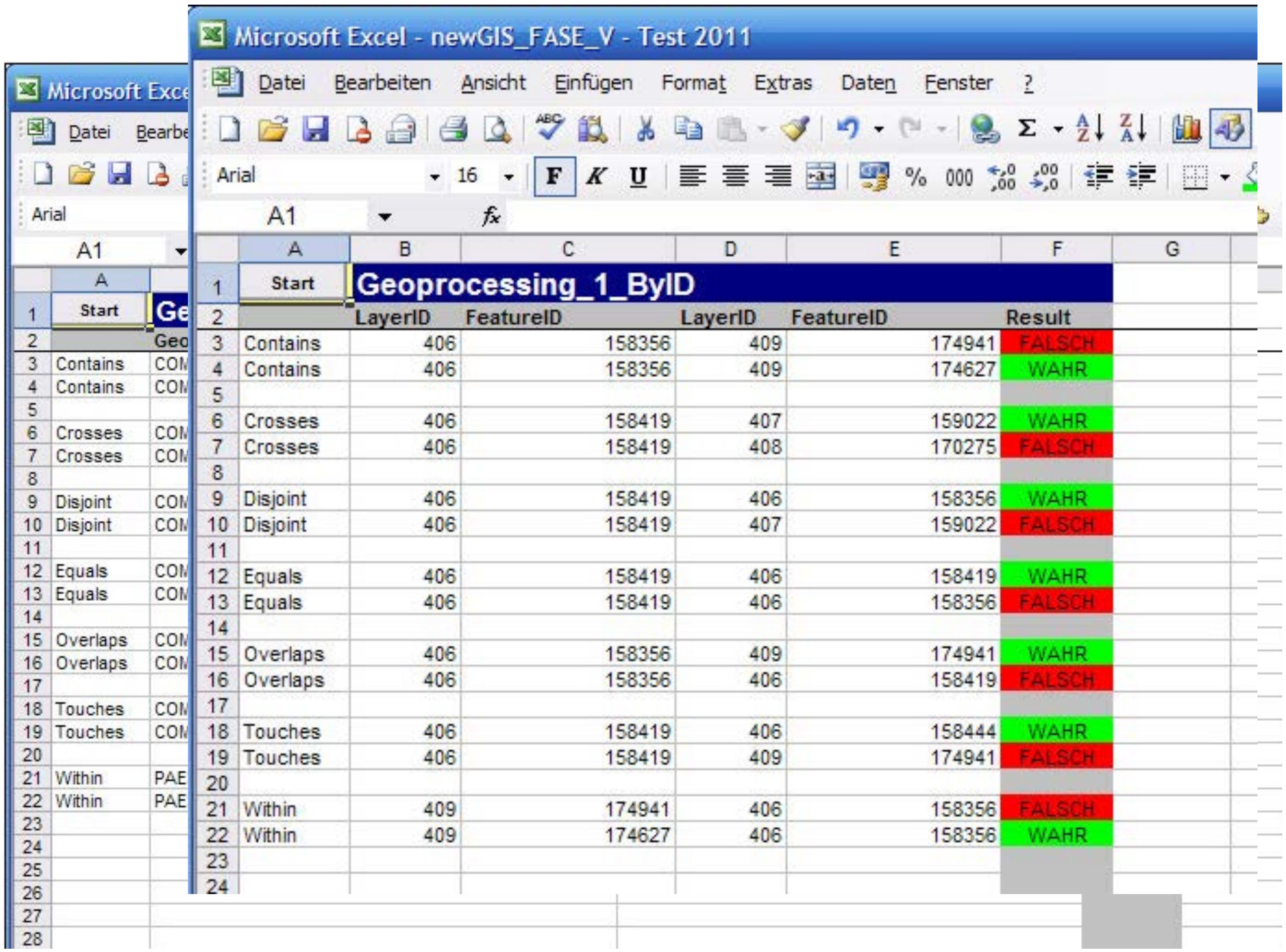
Results: Editing tool



ORACLE SPATIAL

May 2011
Oracle Spatial User Conference

Results: Web Services



	A	B	C	D	E	F
1	Start	Geoprocessing_1_ByID				
2		LayerID	FeatureID	LayerID	FeatureID	Result
3	Contains	406	158356	409	174941	FALSCH
4	Contains	406	158356	409	174627	WAHR
5						
6	Crosses	406	158419	407	159022	WAHR
7	Crosses	406	158419	408	170275	FALSCH
8						
9	Disjoint	406	158419	406	158356	WAHR
10	Disjoint	406	158419	407	159022	FALSCH
11						
12	Equals	406	158419	406	158419	WAHR
13	Equals	406	158419	406	158356	FALSCH
14						
15	Overlaps	406	158356	409	174941	WAHR
16	Overlaps	406	158356	406	158419	FALSCH
17						
18	Touches	406	158419	406	158444	WAHR
19	Touches	406	158419	409	174941	FALSCH
20						
21	Within	409	174941	406	158356	FALSCH
22	Within	409	174627	406	158356	WAHR
23						
24						

Future

- Topological RDBMS and Application metadata
  - Improved performance;
  - Easier management (better configuration tool);
  - Higher responsibility for the database;
- newGIS
  - Migration of existing applications;
  - Publication (Data, Services, …) – INSPIRE directives;
  - Integration with our metadata infrastructure;
  - Clients with enhanced support of the topology;
  - Expansion of services and their orchestration.

ORACLE SPATIAL

May 2011
Oracle Spatial User Conference

ABACO 20 years

new GIS

D E M O N S T R A T I O N

Core Components & Topology

The Story

- **ABACO & ORACLE Topology**:
  - 2006: first approach with **ORACLE 10g topology**
    - prototyping a procedure for update data on the Persistent Topology Data Model
  - 2008/2009: topology was included in the ABACO strategic technology roadmap for keeping abreast of new developments based on **ORACLE (11.1.0.6 → 11.1.0.7)** :
  - 2010/2011: Implementing newGIS Core Components & Topology Loader with **ORACLE 11i**

The Project

- Started with **ORACLE 11.2.0.1:**
- We found some bugs using PL/SQL and the Oracle Spatial JAVA API during the **transposition in the topology**:
  - ORA-29532: Attempt to add an edge that ends in different faces
  - ORA-xxxx: Other less frequent topology related errors…
  - Fixed with the ORACLE patch n° **9571174 (September 2010)**
- We found bugs during the test of the editing functions causing <u>sliver faces, overlaps and holes</u>:
  - Fixed with the ORACLE patch n° **10633470 (February 2010) for ORACLE 11.2.0.2;**

achievements

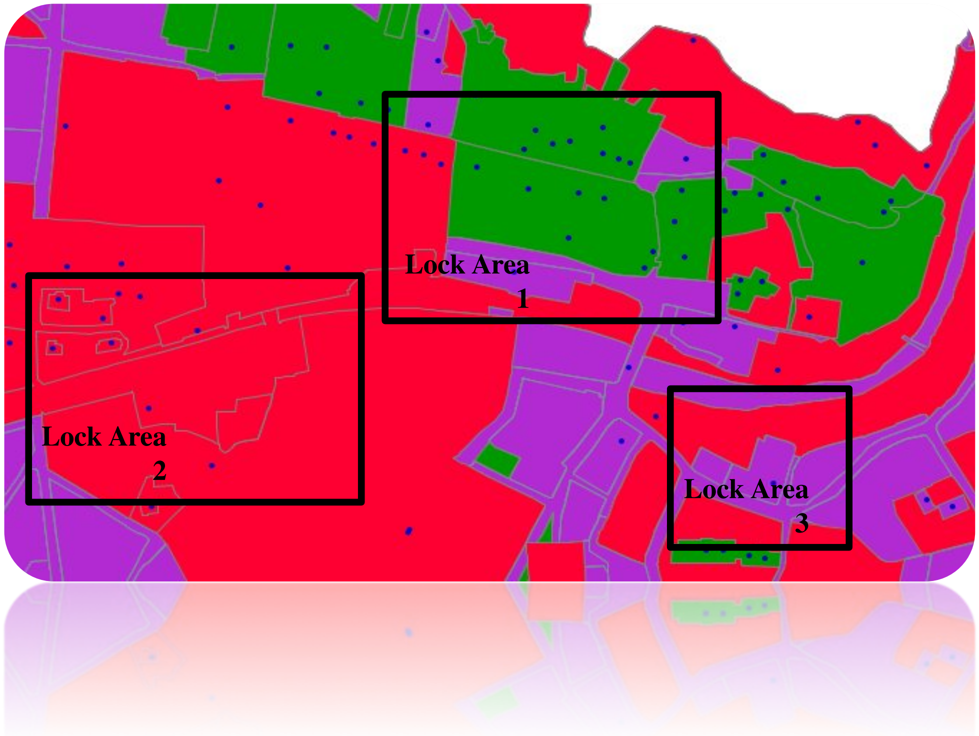
- Base IT functionalities:
  - *Client server communications & DB Operations*
- Locked Area feature:
  - *Where the users works*
- The Rules engine:
  - *How different layers interacts*
- Clone Simple Features:
  - *The system used in a distributed environment*

The Basis

- **newGIS Core Components & Topology Loader are based on Oracle Spatial Topology data model and API (TopoMAP):**
  - Standard Web Services for communications:
    - GML (for geometry transfers);
    - Standard compliance (tested on Java and DotNet);
  - newGIS Core & Topology Loader are connected to Oracle DB through a JDBC connection;
  - The operations on the database are performed through select, insert, update, delete statement and calling PL/SQL procedures;
  - The whole Topology Data Model is managed through SDO_TOPO_GEOMETRY objects and SDO_TOPO_MAP package;
    - http://download.oracle.com/docs/cd/E11882_01/appdev.112/e11831/toc.htm
  - Everything, related to the Simple Feature is managed through SDO_GEOMETRY objects and SDO_GEOM and SDO_UTIL packages;
    - http://download.oracle.com/docs/cd/E11882_01/appdev.112/e11830/toc.htm

Locked Area

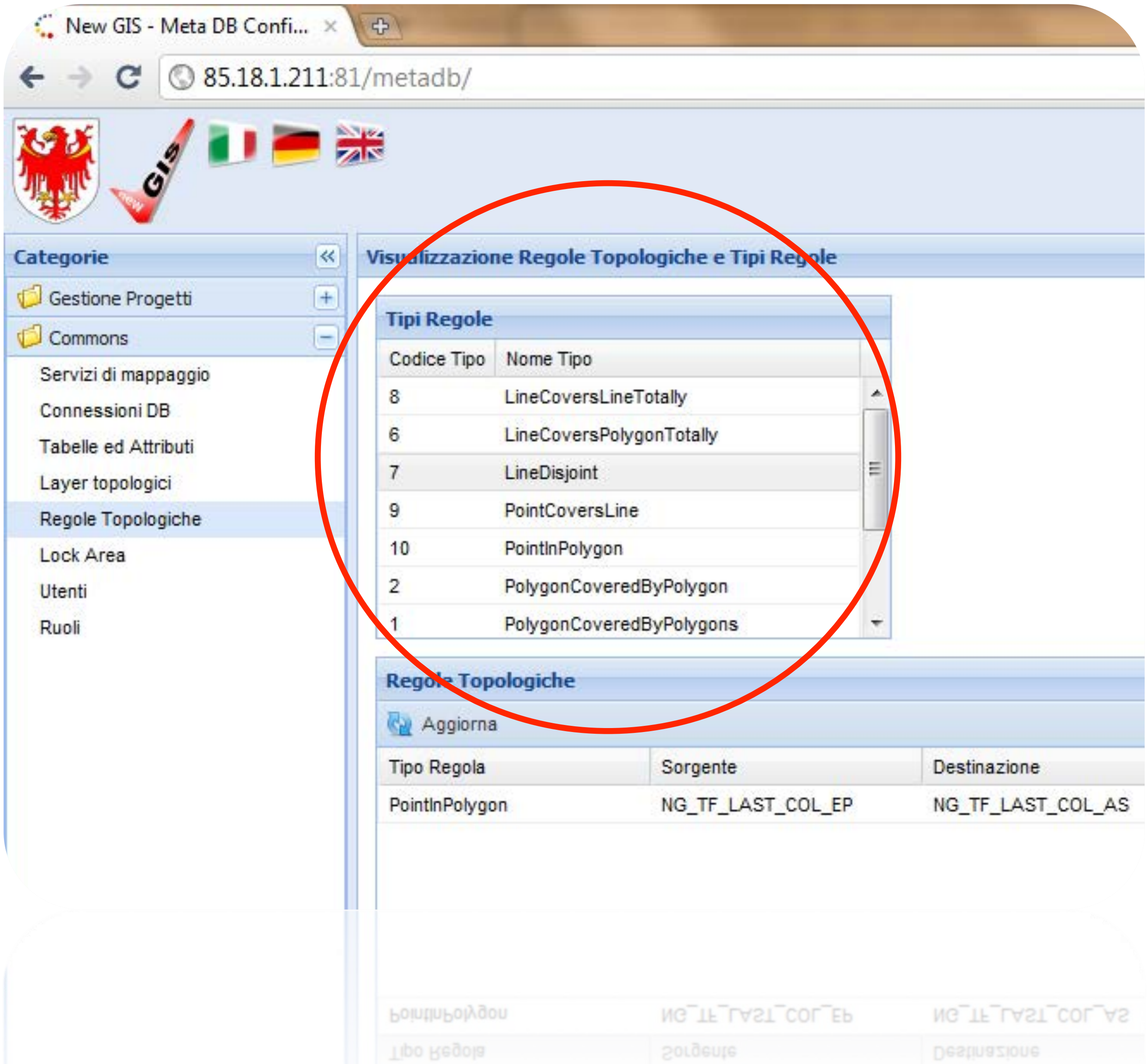
- locked area defines the area where a user is working. All the objects fully included can be modified by that user;
- all the objects that intersect the locked area, can be modified only for the part inside the lock area.
- the server recognizes changes to objects intersecting the area, but external from the locked area, to discard them.



Configurable Rules Engine

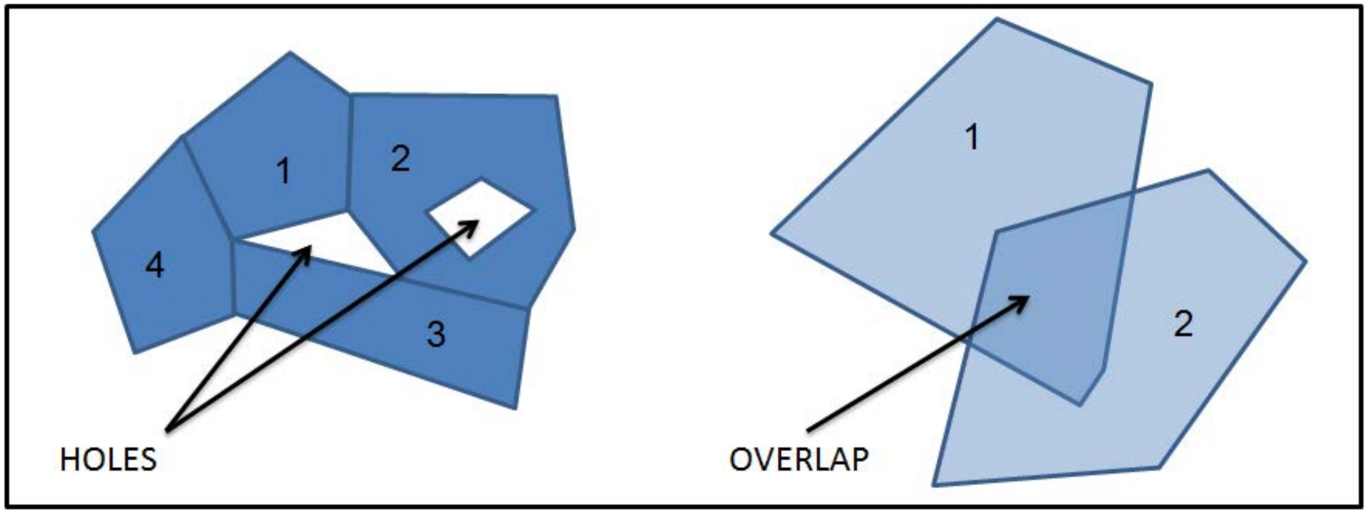
- Two types of rules:
  - **Blocking rules**: the user cannot ever violate the rule;
  - **NON-Blocking rules**: the user can decide if the rule can be violated;
- The server can enforce rules as:
  - **direct**: the rule is always enforced by the system (from A to B);
  - **NON-direct**: the violation is only reported to the user in case of a previous consistent state has been violated (from B to A);

Predefined Rules



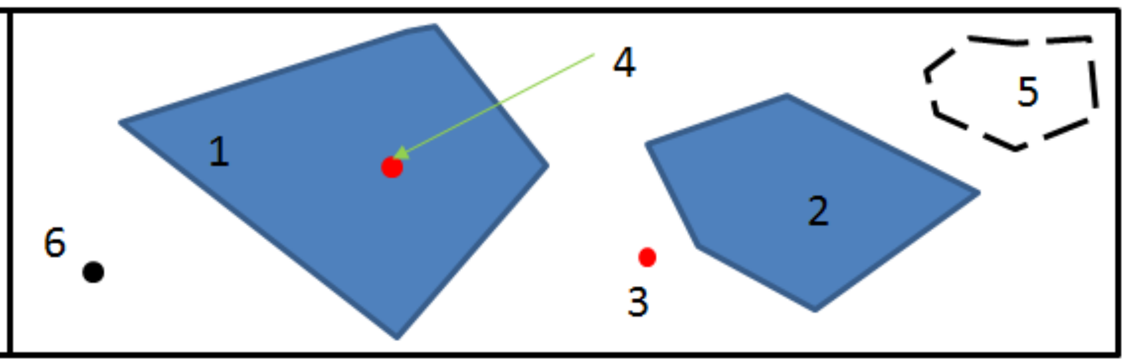
Predefined Rules

Rules within layers :



Rules between layers :

- dots (red)
- Topology layers:
  - Poinygons (blue)
- New objects
  - points & polygons (black)



ORACLE SPATIAL

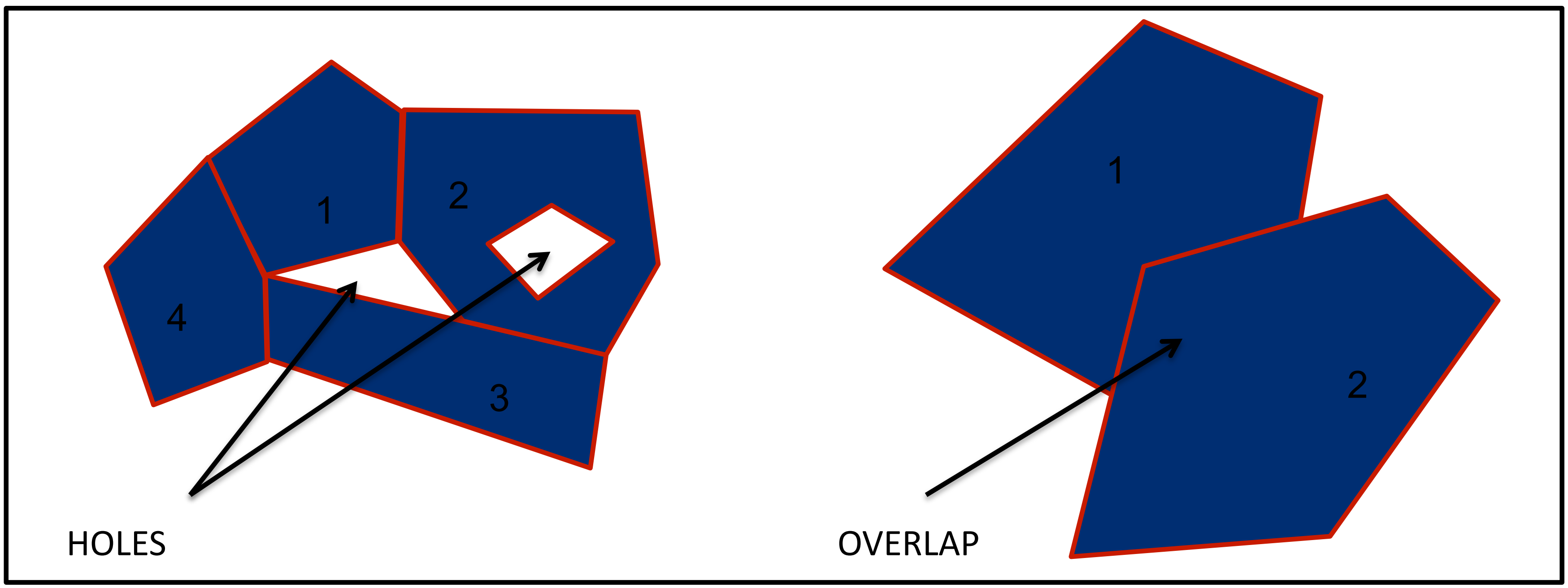
May 2011
Oracle Spatial User Conference

Single Layer Rules

ABACO 20 years

- holes not allowed
- overlap not allowed

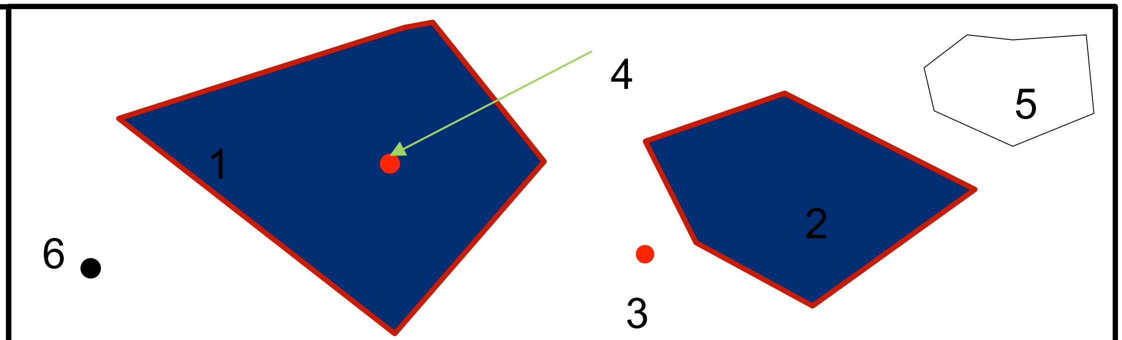
(these are always blocking rules)



i.e. (Point in Polygon from A to B)

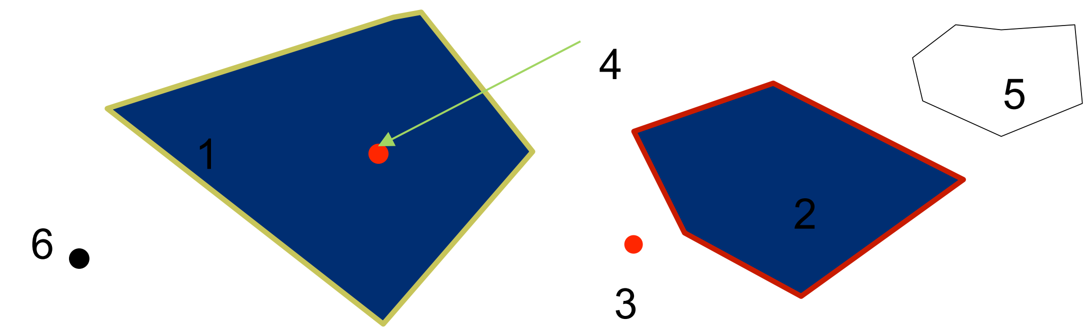
- Layer A: point
- Layer B: polygon
- Defined rule:
  - Point in Polygon from A to B
    - defined as blocking rule from A to B
    - defined as NON-blocking rule from B to A

- topology layers:
  - Points (red)
  - Polygons (blue)
- New objects
  - points & polygons (black)

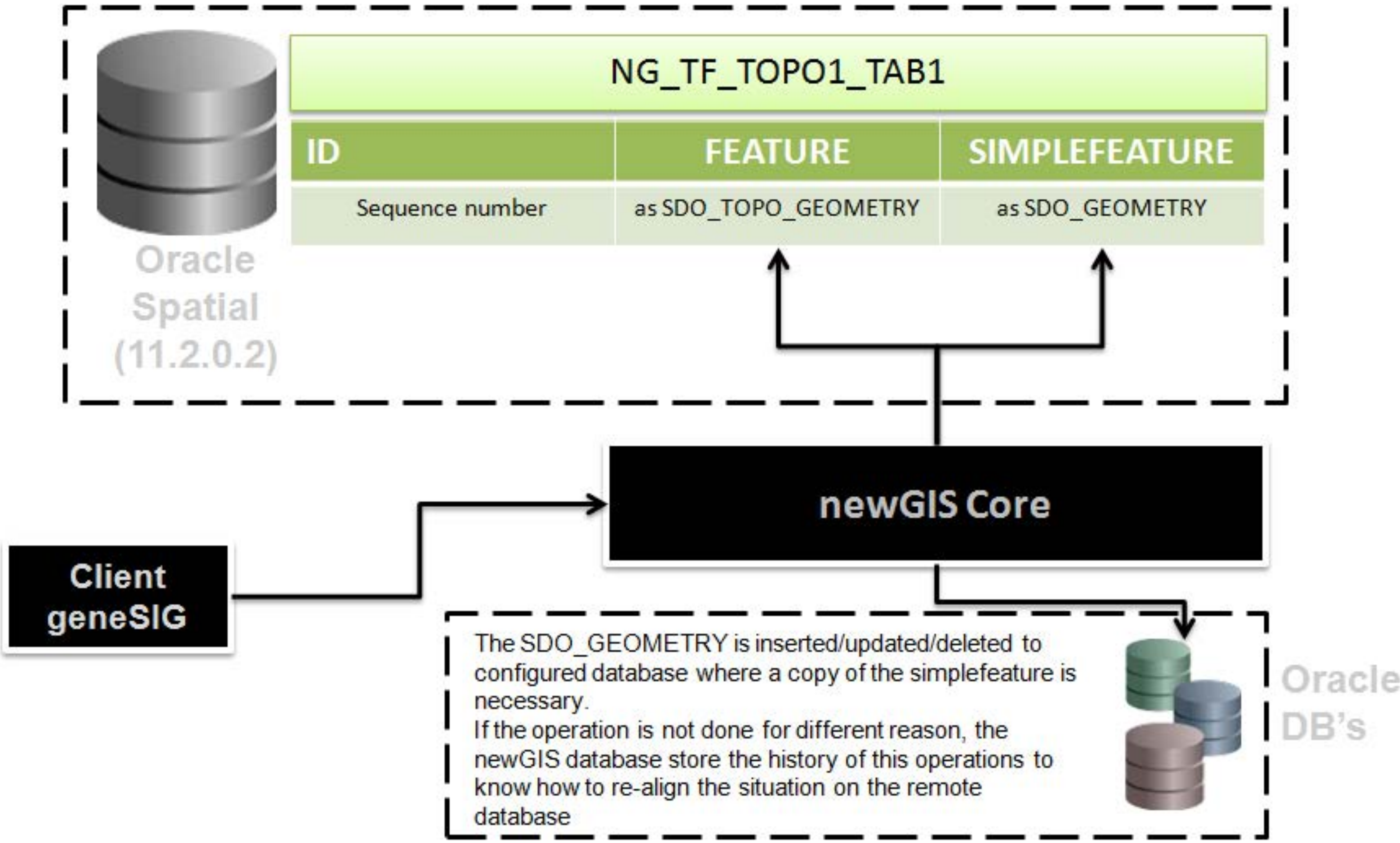


i.e. (Point in Polygon from A to B)

- topology layers:
  - Points (red)
  - Polygons (blue)
- New objects
  - points & polygons (black)



Operation	Result
Delete of object 1	The user is asked for a confirmation of deleting cause of NON-blocking rule violated
Delete of object 2	The polygon is deleted without any request to the user (no changes to a previous consistent situation)
Delete of object 4	The operation is not possible cause of DIRECT BLOCKING RULE
Drawing of polygon 5	The operation is allowed without any request cause the new polygon doesn't make any changes to a previous consistent situation
Drawing of point 6	The operation is not allowed cause of violation of DIRECT BLOCKING RULE


NG_TF_TOPO1_TAB1
ID
FEATURE
SIMPLEFEATURE
Sequence number
as SDO_TOPO_GEOMETRY
as SDO_GEOMETRY
Oracle Spatial (11.2.0.2)
newGIS Core
Client geneSIG
The SDO_GEOMETRY is inserted/updated/deleted to configured database where a copy of the simplefeature is necessary.
If the operation is not done for different reason, the newGIS database store the history of this operations to know how to re-align the situation on the remote database
Oracle DB's

May 2011
Oracle Spatial User Conference

D E M O N S T R A T I O N

Clients & Web Services

ORACLE SPATIAL
May 2011
Oracle Spatial User Conference

The Story

new GIS trilogis

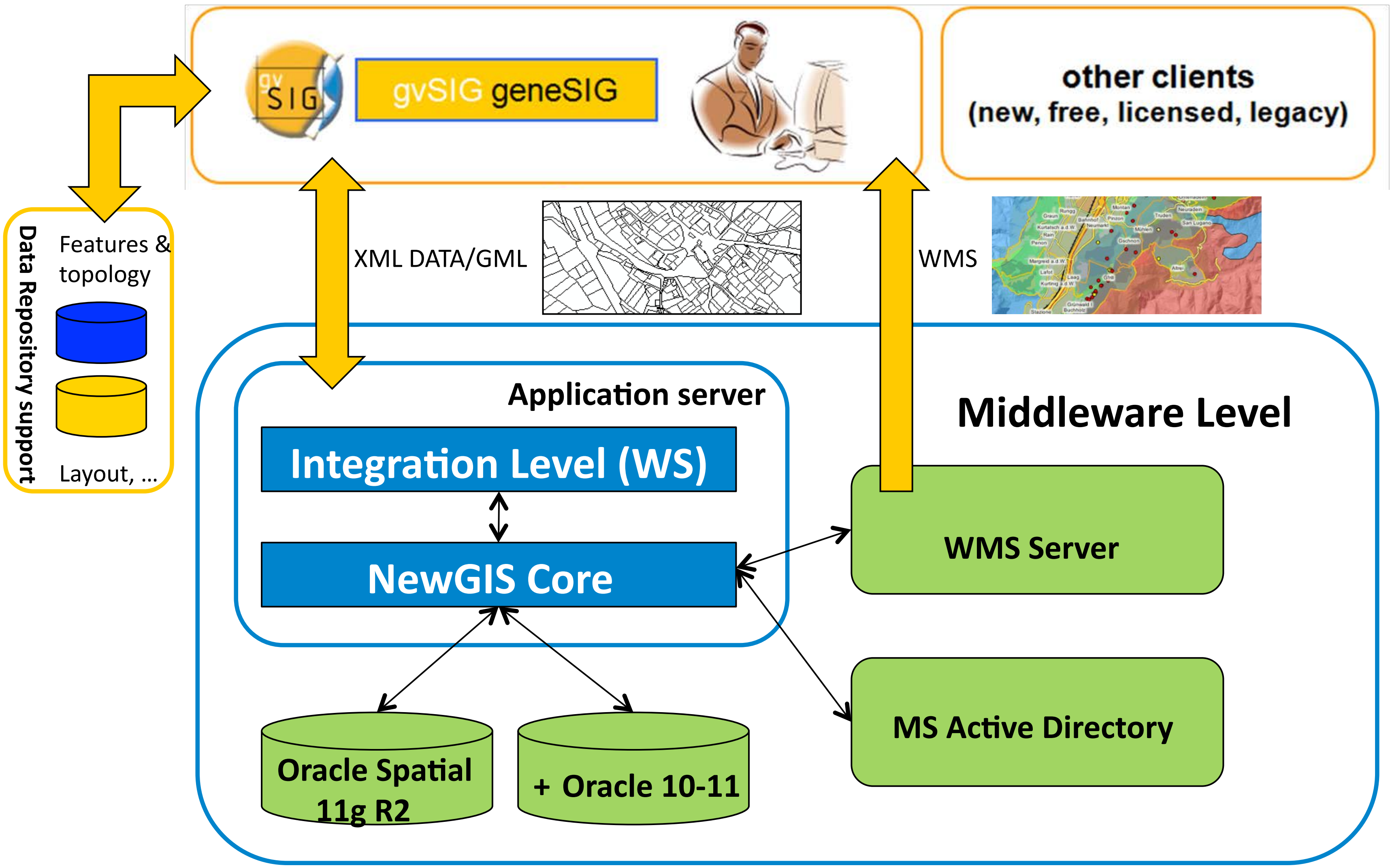
- The **Trilogis & newGIS**:
  - 2006: first approach to feasibility study, in collaboration with the customer;
    - First approach to Oracle Spatial 10g
  - 2007: complete analysis of the feasibility study
    - Definition of macro areas
    - Risk Analysis
    - Estimate of the time and costs
  - 2008/2009: detailed analysis of data management detail section, in collaboration with Abaco and the Customer
  - 2009/2010: implementation of the newGIS web services and the geneSIG Client
    - Project Management & document integration

The Project

- The implementation project starts in February 2010;
- OBS (Organization Breakdown Structure) definition;
- Team definition (9 people on the Supplier side, 5 people on the Customer side);
- Definition of Roles and Responsabilities
  (RAM - Responsability Assignment Matrix);
- Definition of rules of cooperation among suppliers;
- Management and integration of project documentation;
- Monitoring of Milestones and of Project progress;
- Design, analysis and implementation of the client;
- Final acceptance of the project is scheduled for June 2011.

May 2011
Oracle Spatial User Conference

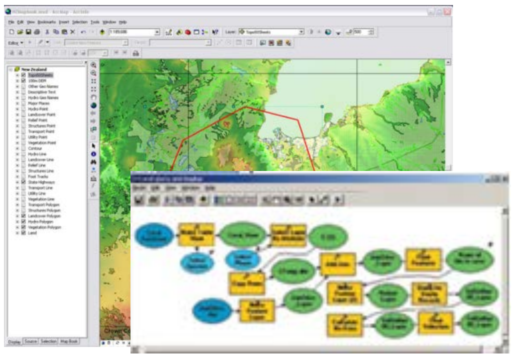
Clients



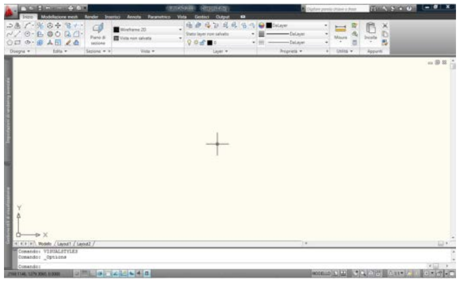
ORACLE SPATIAL
May 2011
Oracle Spatial User Conference

Type of clients

new GIS trilogis



Clients GIS specifics



Clients CAD

Clients Web

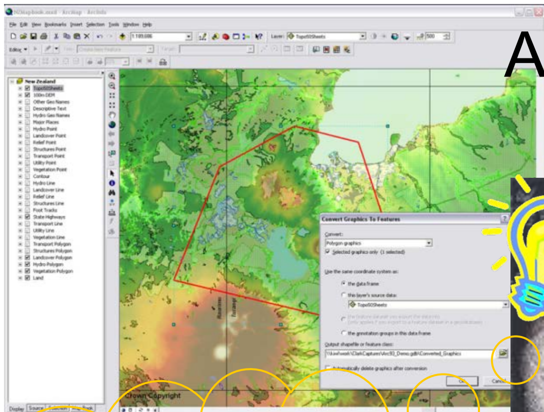
- ✓ The clients have to be designed according to the user needs;
- ✓ in some cases there may be the need of a CAD client;
- ✓ in some other of a high level GIS client;
- ✓ and sometimes only of a light web client.

ORACLE SPATIAL

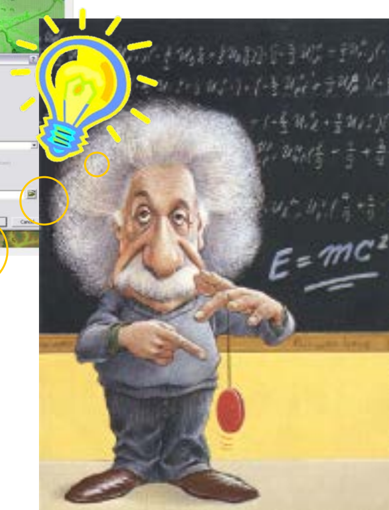
May 2011
Oracle Spatial User Conference

Intelligent Clients

new GIS trilogis



A client can require more intelligence



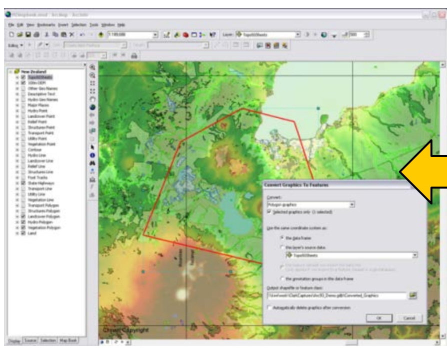
- ✓ Topology;
- ✓ Analisys;
- ✓ Alert;
- ✓ …

Middleware
New GIS

The intelligence of the client for a specific project depends on the requested level of automation, on the complexity of the needs

May 2011
Oracle Spatial User Conference

Types of web services



WS – Of Security

WS – Meta Information

WS – External Functionality

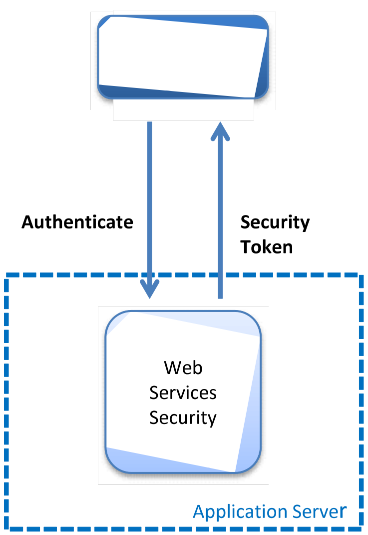
Integration adapting

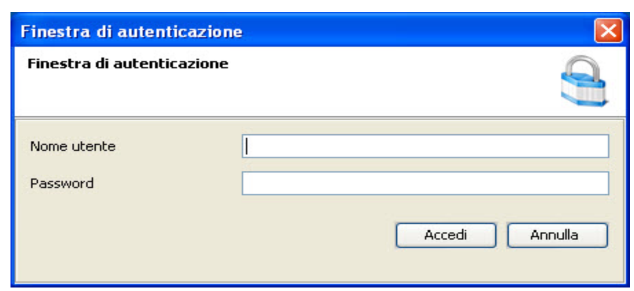
newGIS Core

WS – Of Security

Main goal of web services:

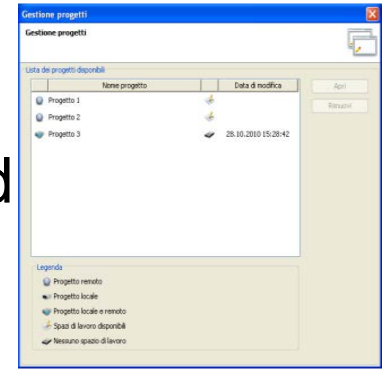
- To provide a simple way to authenticate users
- To define an abstraction level that will be helpfull for integrating newGIS system with Single Sign On and other systems



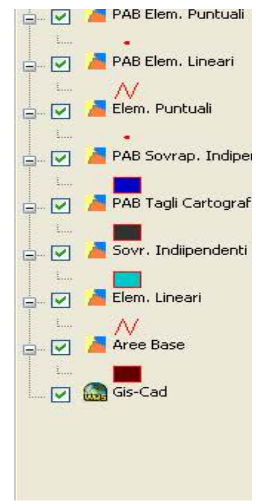


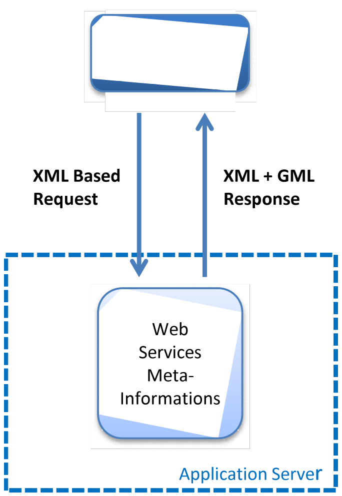
May 2011
Oracle Spatial User Conference

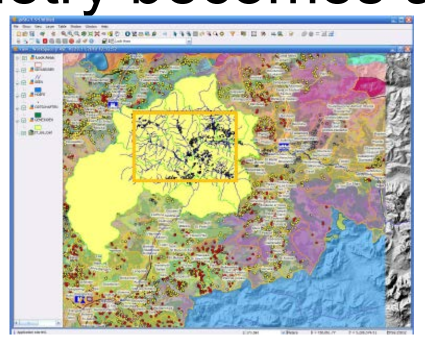
WS - Meta-Info and Spatial Data



- ✓ Informations about projects and work-spaces (layers, rules, background, …);
- ✓ Basic information about the rendering of layers in Table of Content;
- ✓ Transmission of data in both directions (geometry becomes a simple feature);
- ✓ Lock Area;
- ✓ ….

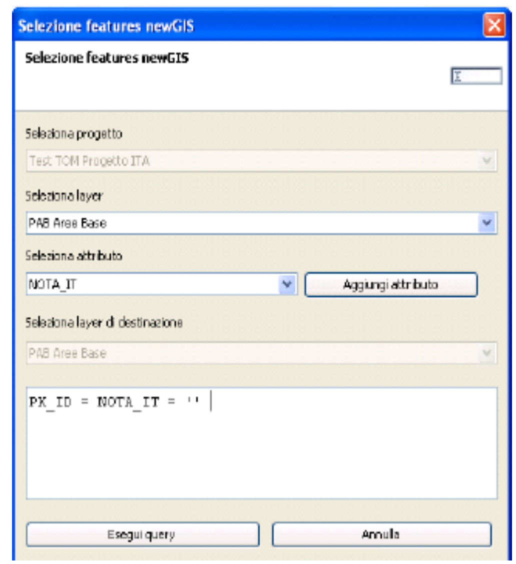


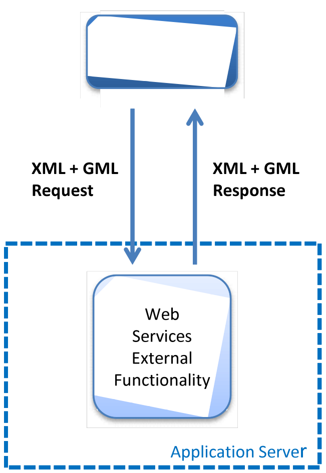




WS - External Functionality

- ✓ Provide spatial functions like:
  - ✓ union
  - ✓ intersect
  - ✓ equals
  - ✓ …





- ✓ Provide a way to execute Oracle’s spatial query or, in general, an entry point on Oracle Topology.

Special thanks to

Giovanni Corcione – ORACLE Italia
Siva Ravada – ORACLE USA

Alessandra Avvenuti
Fulvia Gambalonga
Marco Iellici
Helmuth Leitner
Alessio Modena
Francesco Peloso
Tommaso Nolli
Peter Zanetti
Fabio Tombolesi
Martin Zambaldi

Q&A

ORACLE

SPATIAL

How to contacts us:

wolfgang.moser@provinz.bz.it

ABACO

r.orsi@abacogroup.eu

trilogis

nicola.giuliani@trilogis.it