



**POVEZIVANJE ORACLE SPATIAL-A
|
GOOGLE EARTH SERVISA**

1. Korištena tehnologija

- Oracle Spatial
- Oracle AS
- Google Earth
- KML jezik

ZAŠTO?

2. Povezivanje Oracle Spatial-a i Google Earth-a

- Upis prostornih podataka u Spatial bazu
- PL/SQL skripte za kreiranje KML skripte
- Vizualizacija u Google Earth-u
- Pohrana podataka nastalih u Google Earth-u



Oracle Spatial

(1/2)

- Integrirani skup funkcija i procedura koje omogućuju spremanje, pristup i analizu prostornih podataka unutar Oracle baze podataka
- Podržava standardnu SQL shemu (MDSYS)
- Sastoji se od četiri komponente:
 1. sheme koja propisuje spremanje, sintaksu i semantiku podržanih geometrijskih tipova podataka
 2. prostornog indeksnog mehanizma
 3. skupa operatora i funkcija za izvršavanje prostornih upita (area-of-interest, spatial join) i analizu
 4. alate za administraciju.



Oracle Spatial

(2/2)

- Koristi se SDO_GEOMETRY tip objekta za pohranu prostornih podataka
- Opis fizičkog objekta u prostoru pohranjen je u jednom retku i u samo jednom stupcu.
- Tabele koje koriste SDO_GEOMETRY moraju imati barem još jednu kolonu koja definira primarni ključ



Oracle AS i mod_plsql

(1/3)

- Dio Oracle HTTP servera koji dolazi s Oracle Application Serverom i Oracle bazom
- mod_plsql proširenje pruža podršku aplikacijama, baziranim na PL/SQL-u, za rad na webu
- Zadaci mod_plsql-a:
 1. interpretirati URL koji je uputio web preglednik
 2. pozvati odgovarajuću PL/SQL proceduru koja obrađuje zahtjev
 3. generira HTML stranicu kao odgovor na zahtjev



Oracle AS i mod_plsql

- DAD (Database Access Descriptor)
- Primjer DAD konfiguracijske datoteke kojom se definira „/pls“ virtualna putanja:

```
<Location /pls>
    SetHandler pls_handler
    Order deny,allow
    Allow from all
    AllowOverride None
    PlsqlDatabaseUsername web_user
    PlsqlDatabasePassword @BbS6+FJ9+q1+mhcLXhlsawQ=
    PlsqlDatabaseConnectionString dbserver1:1521:ora10
    ServiceNameFormat
    PlsqlDefaultPage hello
    PlsqlDocumentTablename wwv_flow_file_objects$
    PlsqlDocumentPath docs
    PlsqlDocumentProcedure
    wwv_flow_file_manager.process_download
    PlsqlAuthenticationMode Basic
    PlsqlNLSLanguage CROATIAN_CROATIA.EE8MSWIN1250
</Location>
```



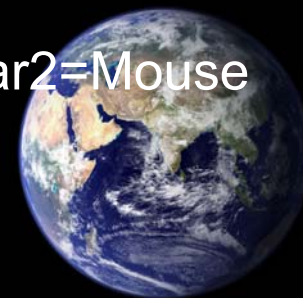
Oracle AS i mod_plsql

- Primjer procedure:

```
CREATE OR REPLACE PROCEDURE hello (par1 IN varchar2, par2 IN
  varchar2) AS
BEGIN
  HTP.HTMLOPEN;           -- generira <HTML>
  HTP.HEADOPEN;          -- generira <HEAD>
  HTP.TITLE('Hello ');  -- generira <TITLE>Hello</TITLE>
  HTP.HEADCLOSE;         -- generira </HEAD>
  HTP.BODYOPEN;          -- generira <BODY>
  HTP.HEADER(1, 'Hello' || par1 || ' ' || par2);
                        -- generira <H1>Hello par1 par2</H1>
  HTP.BODYCLOSE;         -- generira </BODY>
  HTP.HTMLCLOSE;        -- generira </HTML>
END;
```

- Primjer konstrukcije URL-a:

<http://www.mywebserver.com/pls/hello?par1=Mickey&par2=Mouse>



Google Earth

- Produkt tvrtke Keyhole Inc. koja ga je objavila pod nazivom Earth Viewer
- Google je 2004. preuzeo Keyhole Inc. i nastavio s razvojem ali pod nazivom Google Earth
- Izuzetnu popularnost treba tražiti među ovim činjenicama:
 - Google Earth je besplatan (osnovna verzija)
 - ima vrlo kvalitetno sučelje
 - svi podaci mogu se postaviti na web
 - količina i kvaliteta podloga
 - mnoštvo tematskih sadržaja
 - koristi se samo jedan kartografski sustav (WGS84)
- Digital Elevation Model (DEM) tehnologiju u suradnji s NASA's Shuttle Radar Topography Mission (SRTM)



KML jezik

(1/2)

- Keyhole Markup Language, je programski jezik razvijen u kompaniji Keyhole Inc. prije nego je preuzeta od Google-a
- Baziran na XML-u
- Namijenjen je za prikaz geografskih podataka u postojećim ili nekom od budućih, na web-u baziranih, Earth preglednika.
- Open Geospatial Consortium, Inc. (OGC) 14.04.2008. prihvatio je OpenGIS KML Encoding Standard (OGC KML) te je time KML postao otvoreni standard kojeg održava OGC



KML jezik

(2/2)

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<Placemark>
  <name>HrOUG 2008 - Rovinj</name>
  <Point>
    <coordinates>13.64099874255908,45.07291654457031,0
    </coordinates>
  </Point>
</Placemark>
</kml>
```



Povezivanje Oracle Spatiala i Google Earth-a (1/5)

- Upis prostornih podataka u Oracle Spatial bazu

```
CREATE TABLE VOD
(
  ID          NUMBER NOT NULL,
  GEOM        MDSYS.SDO_GEOMETRY,
  OZNAKA      VARCHAR2(255 BYTE),
  NAZIV       LONG,
  NAP_RAZINA  VARCHAR2(255 BYTE),
  TIP         VARCHAR2(255 BYTE)
);
```



Povezivanje Oracle Spatiala i Google Earth-a (2/5)

- Upis podataka u Oracle Spatial bazu

```
INSERT INTO vod (id, geom, oznaka, naziv, nap_razina, tip)
VALUES
(
  '1',
  SDO_GEOMETRY ('LINESTRING(16.805111 46.153588, 16.822202
                46.172742)'),
  'K10-1',
  'KAB VOD 1',
  '10',
  'K'
);
```

- WKT (Well-known text) je jezik za vektorski prikaz objekata u prostoru. Format je definirao Open Geospatial Consortium (OGC).



Povezivanje Oracle Spatiala i Google Earth-a (3/5)

- Dohvat podataka iz Oracle Spatial baze

```
SELECT geom.get_wkt() geom, oznaka, naziv
FROM vod
WHERE ID = 1;
```

<u>GEOM</u>	<u>OZNAKA</u>	<u>NAZIV</u>
LINestring (16.805111 46.153588, 16.822202 46.172742)	K10-1 KAB	VOD 1

- WKT preoblikovati u KML format:

```
<linestring>
  <coordinates>16.805111,46.153588,0 16.822202,46.172742,0
  </coordinates>
</linestring>
```



• PL/SQL procedura za kreiranje KML skripte



```
CREATE OR REPLACE PROCEDURE kml_vod IS
naziv      VARCHAR2 (255);
wkt        LONG;
otvorena   NUMBER; -- pozicija otvorene zgrade
zatvorena  NUMBER; -- pozicija zatvorene zgrade
pomocna    LONG;
BEGIN
    HTP.prn (' <kml xmlns="http://earth.google.com/kml/2.2">
              <Folder>
                <open>1</open>
                <Document>
                  <name>Električni vodovi</name>');
    FOR c1 IN (SELECT * FROM vod) LOOP
        SELECT t.naziv, t.geom.get_wkt () INTO naziv, wkt FROM vod t WHERE
            t.ID = c1.ID;
        otvorena := INSTR (wkt, '(');
        zatvorena := INSTR (wkt, ')');
        pomocna := SUBSTR (wkt, otvorena + 1, zatvorena - otvorena - 1);
        pomocna := REPLACE (pomocna, ' ', 'Z');
        pomocna := REPLACE (pomocna, ',Z', ', ');
        pomocna := REPLACE (pomocna, ', ', ',0 ');
        pomocna := REPLACE (pomocna, 'Z', ',') || ',0';
        HTP.prn ('<Placemark>
                  <name>' || naziv || '</name>
                  <LineString>
                    <coordinates>' || pomocna || '</coordinates>
                  </LineString>
                </Placemark>');
    END LOOP;
    HTP.prn ('</Document>
              </Folder>
            </kml>');
END kml_vod;
```



Povezivanje Oracle Spatiala i Google Earth-a (5/5)

- Procedura kreirana u shemi koja je korištena u definiciji virtualne putanje u DAD-u
- URL za pokretanje procedure:

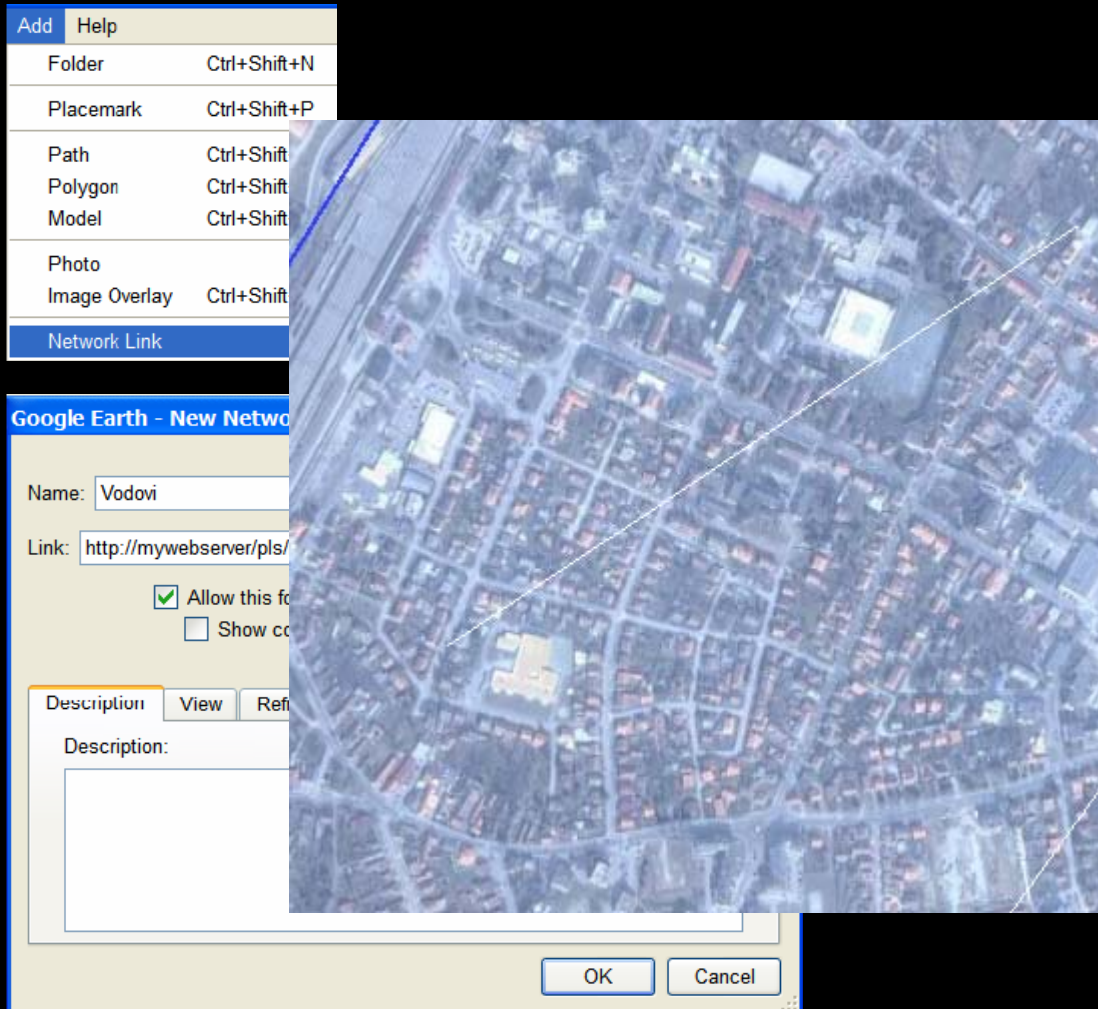
http://mywebserver/pls/kml_vod



Vizualizacija u Google Earth-u

(1/2)

- Kreiranje Network Link-a



The screenshot shows the Google Earth interface with an aerial view of a city. The 'Add' menu is open, listing various features: Folder (Ctrl+Shift+N), Placemark (Ctrl+Shift+P), Path (Ctrl+Shift), Polygon (Ctrl+Shift), Model (Ctrl+Shift), Photo, and Image Overlay (Ctrl+Shift). The 'Network Link' option is highlighted at the bottom of the menu.

The 'New Network Link' dialog box is open, showing the following fields and options:

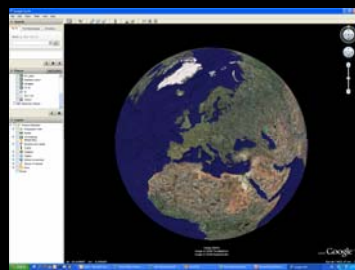
- Name: Vodovi
- Link: <http://mywebserver/pls/>
- Allow this for
- Show co
- Description: (empty text area)

Buttons for 'OK' and 'Cancel' are visible at the bottom of the dialog box.



Vizualizacija u Google Earth-u

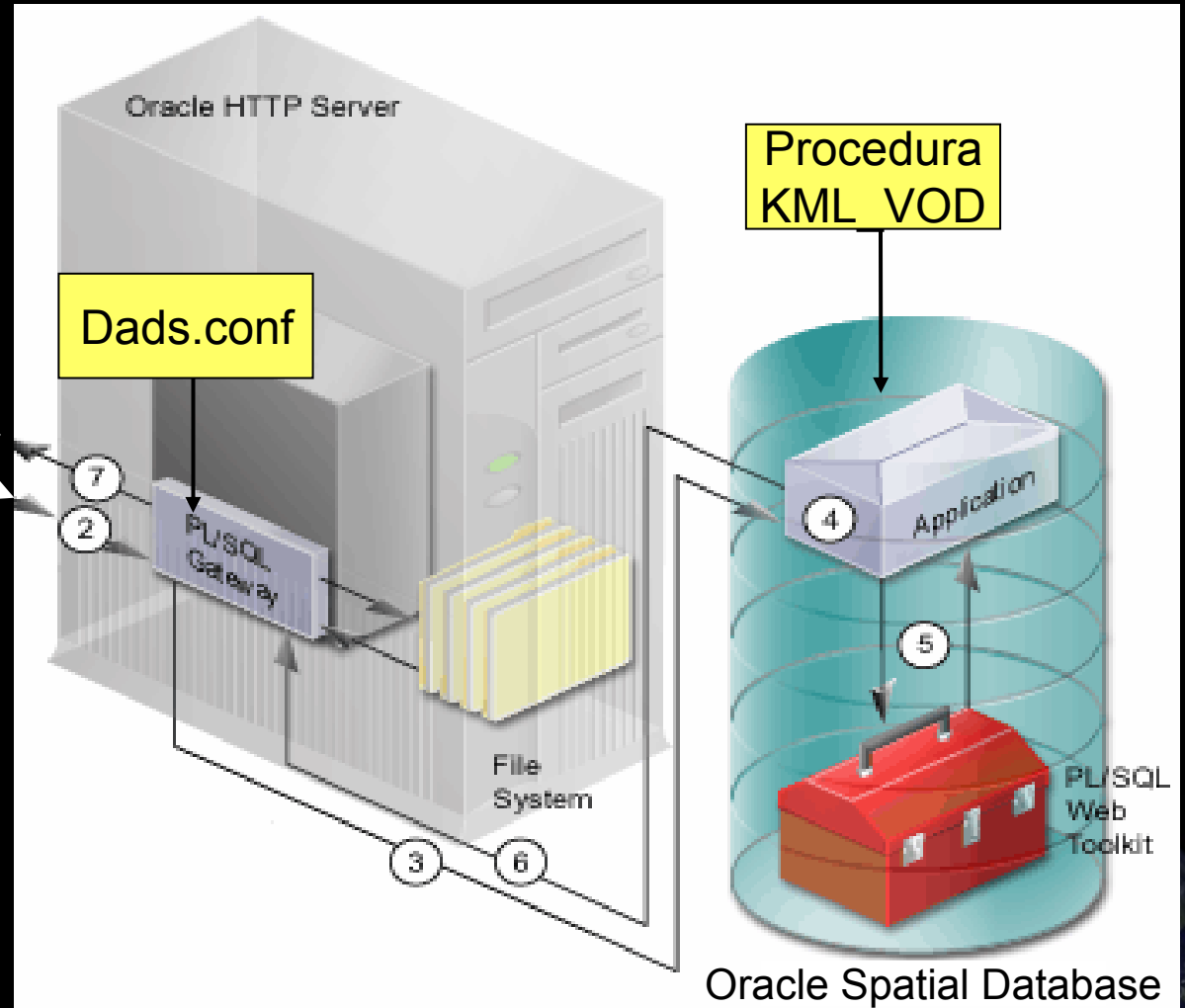
(2/2)



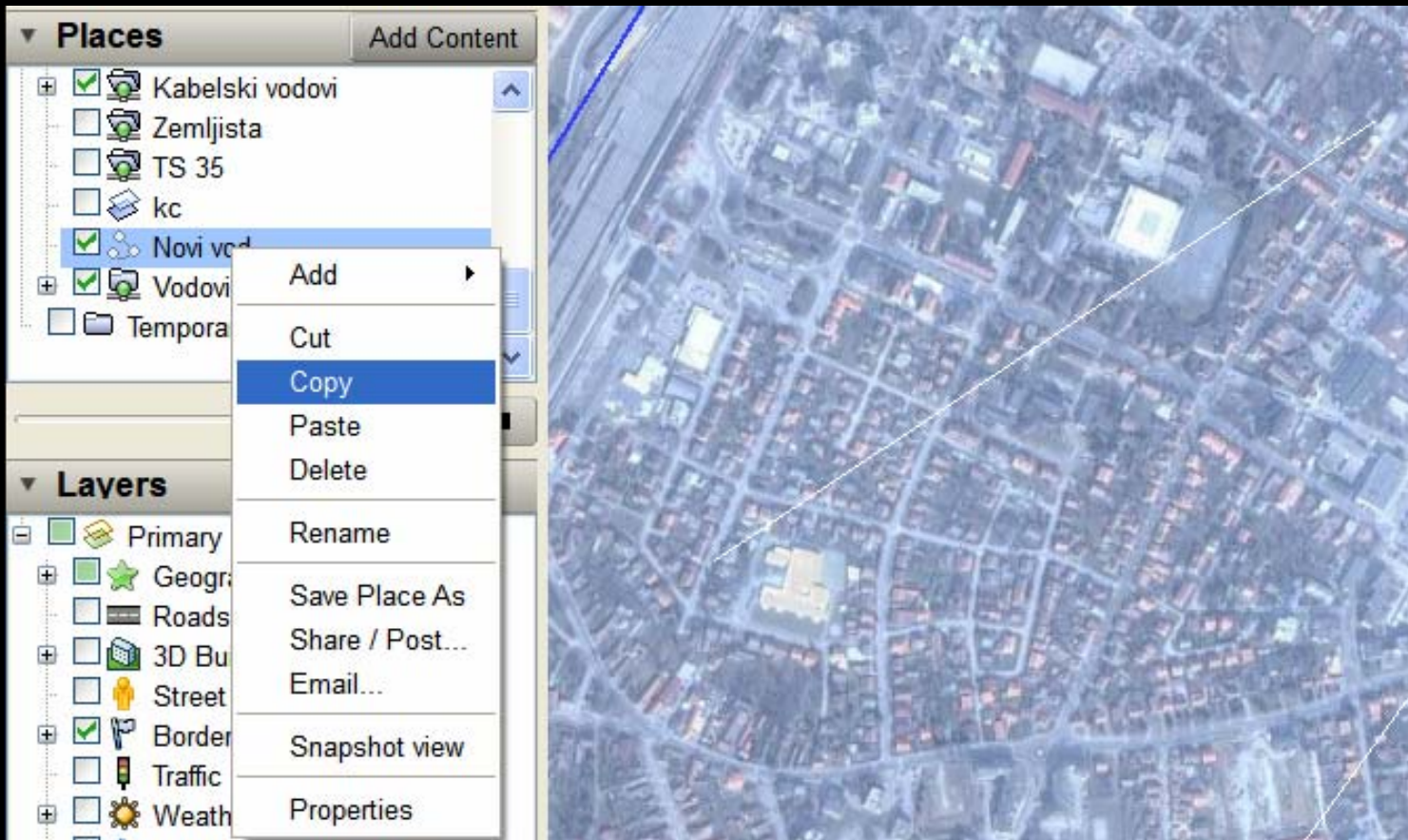
KML

1

http://mywebserver/pls/kml_vod



Pohrana prostornih podataka iz Google Earth-a u Oracle Spatial bazu podataka (1/4)



Pohrana prostornih podataka iz Google Earth-a u Oracle Spatial bazu podataka

- KML skripta:

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.2">
<Document>
  <name>KmlFile</name>
  <Placemark>
    <name>Novi vod</name>
    <LineString>
      <tessellate>1</tessellate>
      <coordinates>
        16.81779547674719,46.1616150856538,0
        16.82663065670053,46.16568244540768,0
      </coordinates>
    </LineString>
  </Placemark>
</Document>
</kml>
```



Pohrana prostornih podataka iz Google Earth-a u Oracle Spatial bazu podataka

- PL/SQL procedura za kreiranje WKT-a:

```
CREATE OR REPLACE PROCEDURE kml2wkt
(kml IN CLOB, sdo OUT CLOB, tip IN NUMBER) IS
-- TIP: 1 - POINT      2 - LINESTRING      3 - POLYGON
pomocna CLOB;
BEGIN
    pomocna := SUBSTR (kml, INSTR (kml, '<coordinates>') + 13);
    pomocna := SUBSTR (pomocna, 1, INSTR (pomocna, '</coordinates>') - 1);
    pomocna := REPLACE (pomocna, ',0', 'Z');
    pomocna := REPLACE (pomocna, ',', ' ');
    pomocna := REPLACE (pomocna, 'Z', ',');
    pomocna := SUBSTR (pomocna, 1, LENGTH (TRIM (pomocna)) - 1);
    CASE tip
        WHEN 1 THEN
            sdo := 'POINT (' || pomocna || ')';
        WHEN 2 THEN
            sdo := 'LINESTRING (' || pomocna || ')';
        WHEN 3 THEN
            sdo := 'POLYGON ((' || pomocna || '))';
    END CASE;
END kml2wkt;
```



Pohrana prostornih podataka iz Google Earth-a u Oracle Spatial bazu podataka

- Insert objekta u Oracle Spatial bazu na temelju WKT-a kojeg je vratila procedura kml2wkt

```
INSERT INTO vod (id, geom, oznaka, naziv, nap_razina, tip)
VALUES
(
  '99',
  SDO_GEOMETRY ('LINESTRING( 16.805111 46.153588,
                               16.822202 46.172742) '),
  'K10-99',
  'KAB VOD 99',
  '10',
  'K'
);
```

