

ORACLE®

**Satellitenbilder, Orthofotos und mehr:
Oracle GeoRaster**



Rasterdaten in der Oracle-Datenbank

- Native Datentypen
 - SDO_GEOASTER
 - SDO_RASTER
- "Intelligenz" in der Datenbank: Funktionalität
 - Importieren / Laden von Rasterdaten
 - Georeferenzierung
 - Bearbeiten von Rasterdaten
 - Metadaten-Verwaltung
 - Export / Visualisierung

Rasterdaten

Datenformate ...

- Unterstützung "out-of-the-box" für ...
 - **ESRI World Files**
 - JPEG / JPEG2000
 - GIF
 - TIF/**GeoTiff**
 - BMP
 - Digital Globe RPC
- 3rd Party Tools ...
 - SafeFME, andere ...

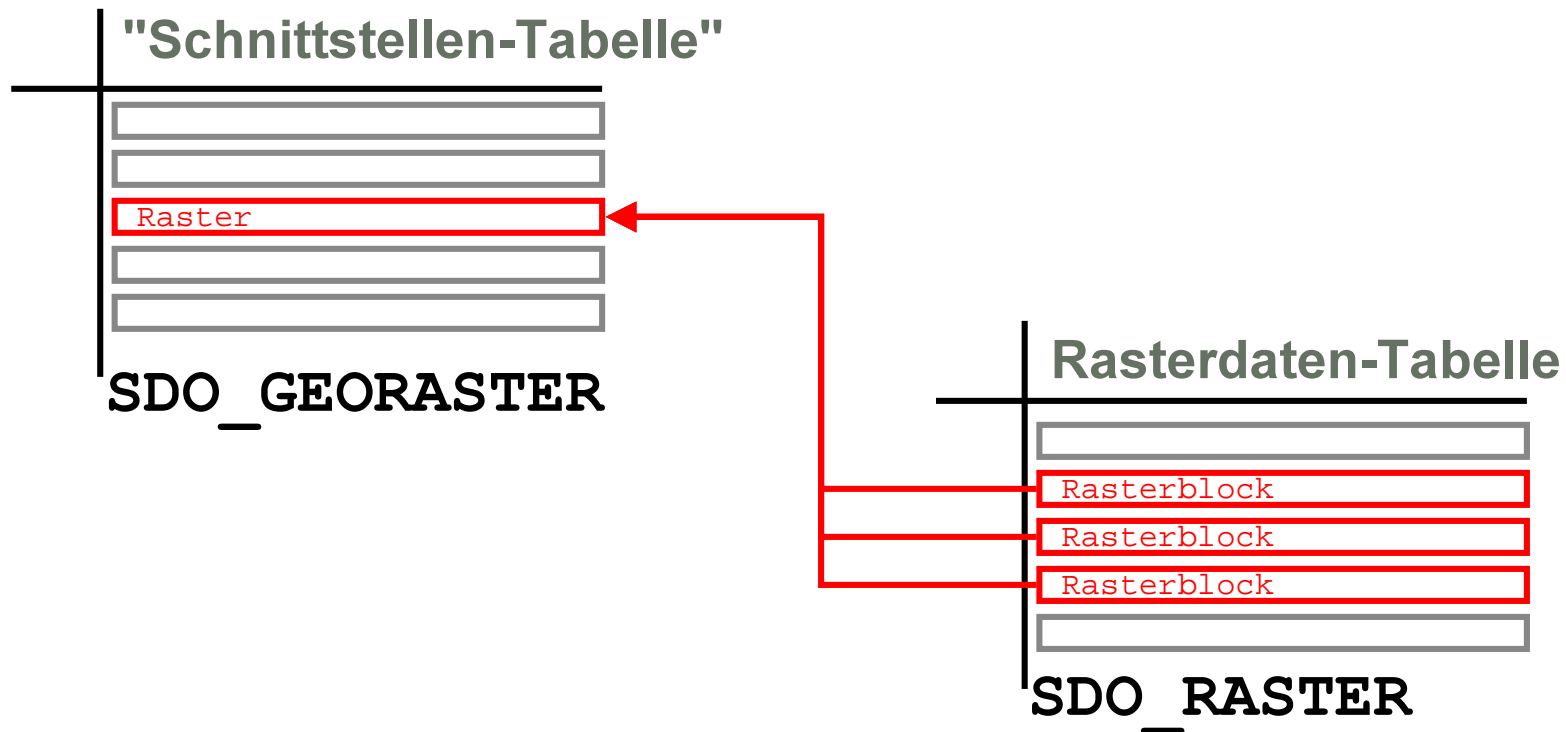
ESRI World File (.tfw)

```
62.5000000000000000  
0.0000000000000000  
0.0000000000000000  
-62.5000000000000000  
32760031.2500000000000000  
5364968.7500000000000000
```



Speicherung der Rasterdaten

- Datenmodell



Datentypen

```
SQL> desc SDO_GEORASTER
```

Name	Null?	Type
RASTERTYPE		NUMBER
SPATIALEXTENT		MDSYS.SDO_GEOMETRY
RASTERDATATABLE		VARCHAR2 (32)
RASTERID		NUMBER
METADATA		SYS.XMLTYPE

```
SQL> desc SDO_RASTER
```

Name	Null?	Type
RASTERID		NUMBER
PYRAMIDLEVEL		NUMBER
BANDBLOCKNUMBER		NUMBER
ROWBLOCKNUMBER		NUMBER
COLUMNBLOCKNUMBER		NUMBER
BLOCKMBR		MDSYS.SDO_GEOMETRY
RASTERBLOCK		BLOB



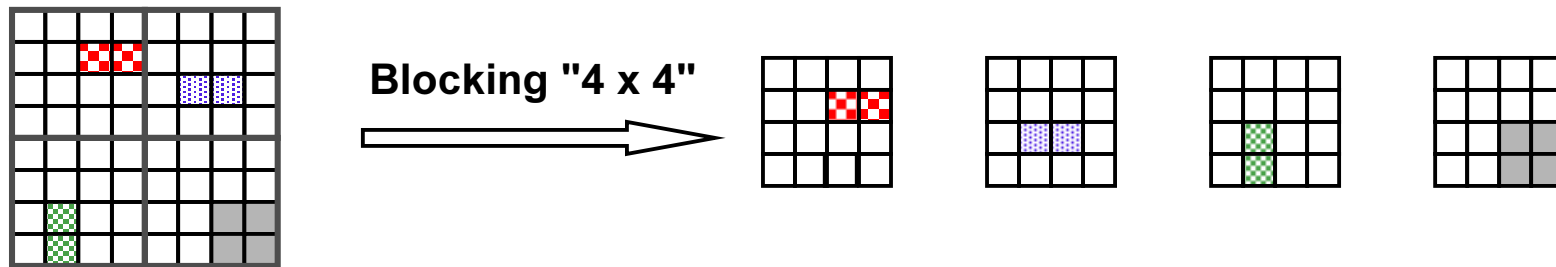
Speicherung der Rasterdaten

- "Schnittstellen"-Tabelle
 - Eine Zeile pro Rasterkachel
 - Metadaten ...
 - Georeferenzierung der Kachel: *Spatialextent*
 - Auflösungs-Pyramiden
 - Name der Rasterdatentabelle
- Rasterdatentabelle
 - Eine Zeile pro Rasterblock: mehrere Blocks pro Rasterkachel
 - Rasterdatenblöcke als BLOBs
 - Blocking-Verhalten je nach Einstellung beim Import

Speicherung der Rasterdaten

Blocking

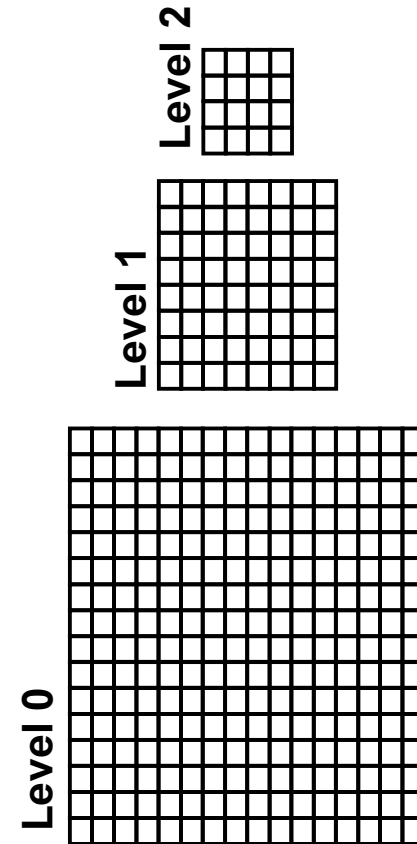
- Rasterkacheln können extrem groß werden
 - Bsp: Hochauflösendes Orthofoto: 750MB
 - Ziel: Speicherung in kleinen Einheiten - Skalierung!
- Effizientere Speicherung in kleineren Blöcken
- GeoRaster erlaubt das "*Blocking*" anhand ...
 - "Bands", "Zeilen", "Spalten"



Auflösungspyramiden

- Vorberechnung von Ansichten der Rasterdaten mit geringerer Auflösung
- Höhere "Pyramidenebene" bedeutet geringere Auflösung
- Ebene 0: Originaldaten

```
sdo_geor.generatePyramid(  
  georaster => gr,  
  pyramidparams =>  
    'rlevel=2, resampling=NN'  
);
```



Setup "Rasterkacheln in der Datenbank"

- 1. Schritt: Anlegen der Rastertabelle

```
CREATE TABLE MY_RASTER_TAB (  
  ID          NUMBER PRIMARY KEY,  
  SOURCE_FILE VARCHAR2(80),  
  DESCRIPTION VARCHAR2(32),  
  GEORASTER  SDO_GEORASTER  
)
```

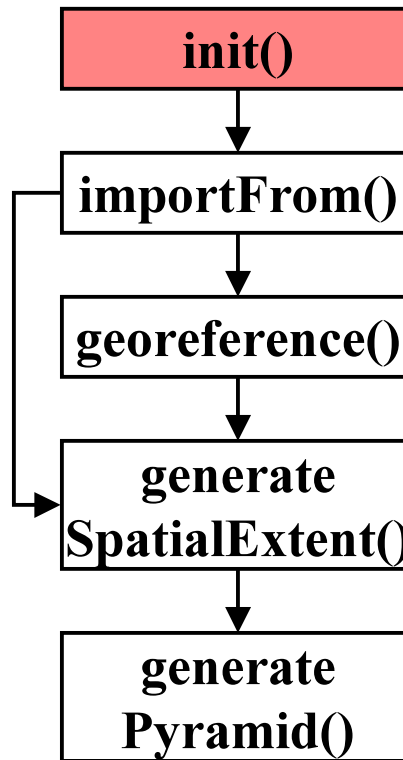
- 2. Schritt: Anlegen der Rasterdatentabelle

```
CREATE TABLE RDT_1 OF SDO_RASTER (  
  PRIMARY KEY (  
    RASTERID, PYRAMIDLEVEL, BANDBLOCKNUMBER,  
    ROWBLOCKNUMBER, COLUMNBLOCKNUMBER  
  )  
) LOB (RASTERBLOCK) STORE AS (NOCACHE NOLOGGING);
```

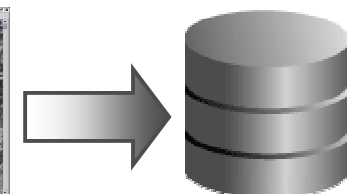
Rasterdaten

Server-gestützter Ladevorgang

- PL/SQL Prozedur SDO_GEOR.importFrom()



ESRI World Files: SRID angeben



GeoRaster Setup - Syntaxbeispiele

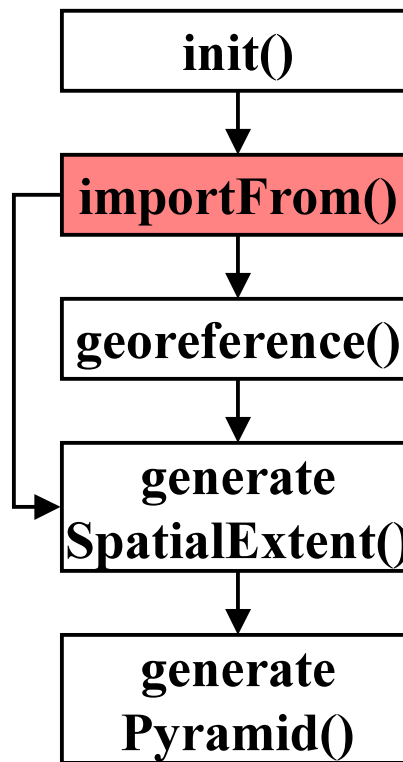
- 3. Schritt: Initialisierung der Raster-Objekte
 - Erzeugung "leerer" Rasterkacheln

```
INSERT INTO MY_RASTER_TAB (  
    ID, GEORASTER  
) VALUES (  
    1, SDO_GEOR.INIT('RDT_1', 1)  
)  
  
:  
  
INSERT INTO MY_RASTER_TAB (  
    ID, GEORASTER  
) VALUES (  
    4, SDO_GEOR.INIT('RDT_1', 100)  
)
```

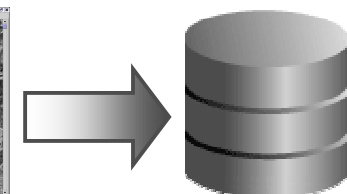
Rasterdaten

Server-gestützter Ladevorgang

- PL/SQL Prozedur SDO_GEOR.importFrom()



ESRI World Files: SRID angeben





GeoRaster Setup – Syntaxbeispiele

Laden mit PL/SQL Paket SDO_GEOR

```
declare
  g sdo_georaster;
begin
  select georaster into g from my_raster_tab
  where id = 1 for update;

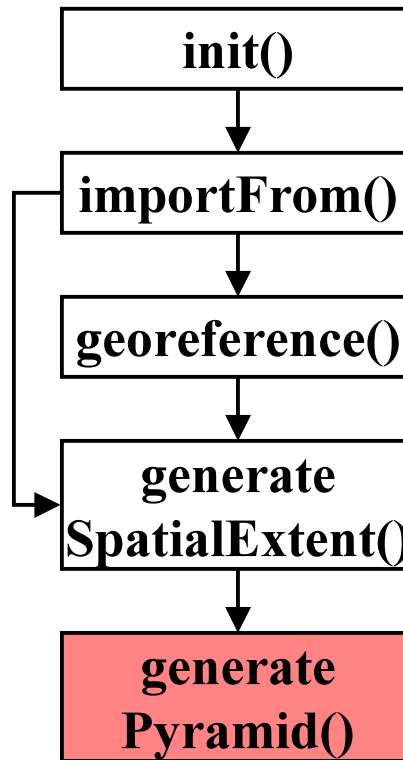
  sdo_geor.importFrom(
    georaster =>      g,
    storageparam =>  'blocksize=(512,512)',
    r_sourceformat => 'TIFF',
    r_sourcetype  =>  'file',
    r_sourcename  =>  '../images/image01.tif',
    h_sourceformat => 'WORLDFILE',
    h_sourcetype  =>  'file',
    h_sourcename  =>  '../images/image01.tfw',
  );

  update my_raster_tab set georaster = g
  where id = 1;
end;
```

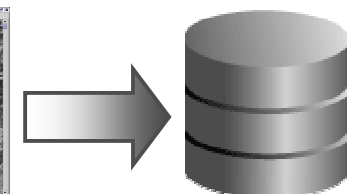
Rasterdaten

Server-gestützter Ladevorgang

- PL/SQL Prozedur SDO_GEOR.importFrom()



ESRI World Files: SRID angeben





GeoRaster Setup – Syntaxbeispiele

Auflösungspyramide generieren

```
declare
  geor sdo_georaster;
begin
  select georaster into geor from my_raster_tab
  where id = 1 for update;

  sdo_geor.generatePyramid(
    georaster => geor,
    pyramidparams => 'rlevel=4'
  );

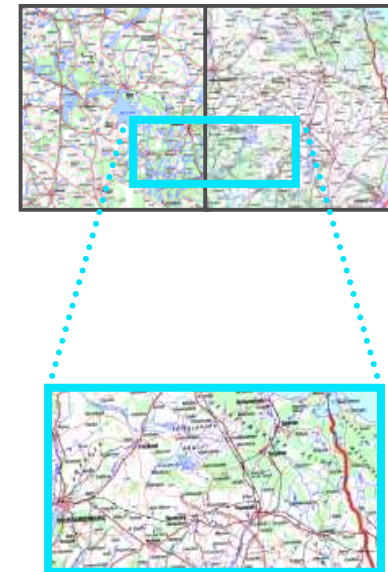
  update my_raster_tab
    set georaster = geor
  where id = 1;
end;
```

GeoRaster Setup – Syntaxbeispiele

Ausschnitt aus der Rasterkachel zeigen ...

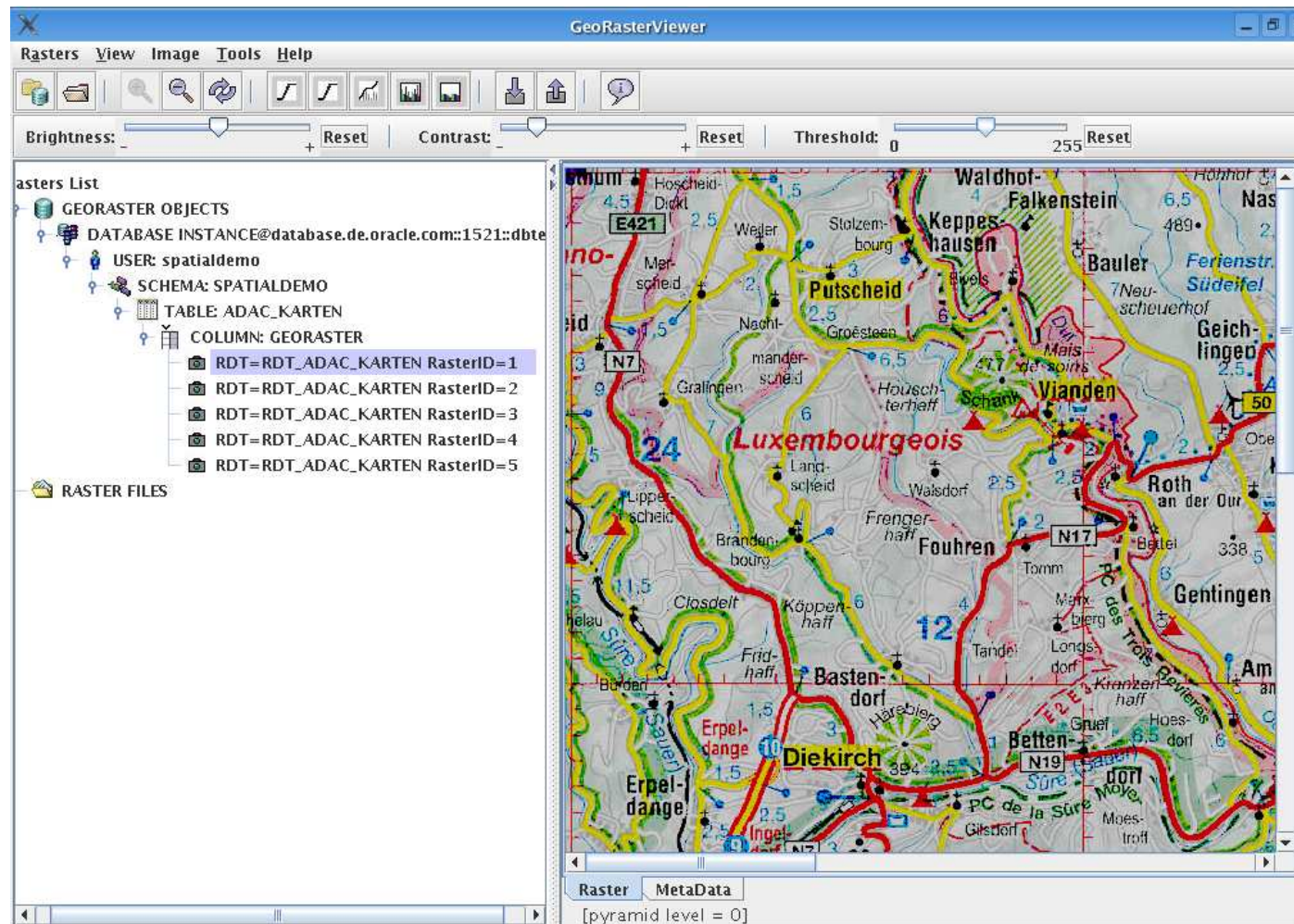
- PL/SQL Prozedur
 - Wird für Kartendarstellung transparent genutzt

```
sdo_geor.getRasterSubset(  
  georaster => g,  
  pyramidlevel => 0,  
  layernumbers => '1-3',  
  window => sdo_geometry(  
    2003, 8307, null,  
    sdo_elem_info_array(1, 1003, 3),  
    sdo_ordinate_array(  
      7.8095747, 50.3160369,  
      8.4189001, 50.7910561  
    )  
  ),  
  rasterBlob => b  
);
```



Rasterkacheln in der Datenbank

GeoRasterViewer



Rasterkacheln in der Datenbank GeoRasterViewer

The screenshot displays the GeoRasterViewer application window. The interface includes a menu bar (Rasters, View, Image, Tools, Help), a toolbar with various icons, and a control panel with sliders for Brightness and Contrast, and a Threshold slider. The main area is divided into two panes: a tree view on the left and a metadata table on the right.

Tree View (Left Pane):

- GEORASTER OBJECTS
 - DATABASE INSTANCE@database.de.oracle.com::1521::dbte
 - USER: spatialdemo
 - SCHEMA: SPATIALDEMO
 - TABLE: ADAC_KARTEN
 - COLUMN: GEORASTER
 - RDT=RDT_ADAC_KARTEN RasterID=1 (Selected)
 - RDT=RDT_ADAC_KARTEN RasterID=2
 - RDT=RDT_ADAC_KARTEN RasterID=3
 - RDT=RDT_ADAC_KARTEN RasterID=4
 - RDT=RDT_ADAC_KARTEN RasterID=5

- RASTER FILES

Attribute	Value
objectInfo	
rasterType	21001
isBlank	false
defaultRed	1
defaultGreen	2
defaultBlue	3
rasterInfo	
cellDepth	8
cellDepth_text	8BIT_U
totalDimensions	3
dimensionSize	
row	1200
column	1600
band	3
ULTCordinate	
row	0
column	0
band	0
blocking	
type	REGULAR
totalRowBlocks	1200
totalColumnBlocks	1
totalBandBlocks	1
rowBlockSize	1
columnBlockSize	1600
bandBlockSize	3
interleaving	BIP
pyramid	
type	DECREASE
maxLevel	4
compression	
type	NONE

Raster Metadata
[pyramid level = 0]

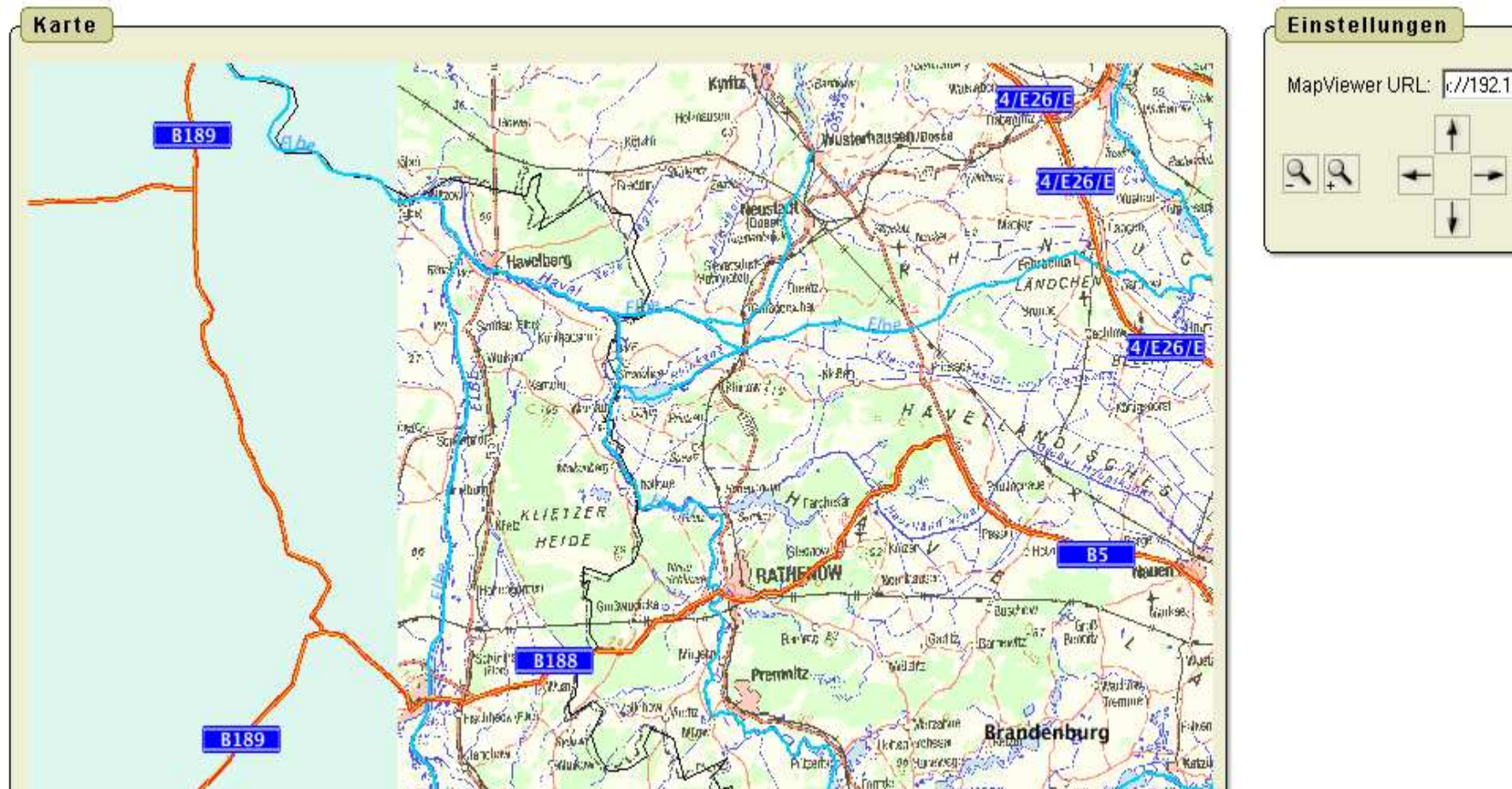
Rasterkacheln in der Datenbank Oracle MapBuilder

The screenshot displays the Oracle MapBuilder application window. The title bar reads "Oracle Map Builder". The menu bar includes "File", "Edit", "View", "Tools", "Window", and "Help". The main interface is divided into several sections:

- Connection:** "database.de.oracle.com"
- Layers:** A tree view on the left shows "Metadata" (Styles, Themes, Base Maps, Tile Layers) and "Hide Data" (Spatial Tables, Annotation Tables, Geometry Tables, GeoRaster Tables, Topology Tables). Under "GeoRaster Tables", "SPATIALDEMO" and "ADAC_KARTEN" are visible.
- Map View:** A central map showing a geographical area with roads, rivers, and labels like "Naturpark (Südeifel)". A scale bar indicates 0, 5000, and 10000 meters.
- Parameters:** Below the map, "Table: ADAC_KARTEN", "Column: GEORASTER", and "GeoRaster: 1:RDT_ADAC_KARTEN" are displayed. There are also checkboxes for "Use Query Condition:" and "normalize".
- Messages:** A log window at the bottom shows system messages such as "INFO: **** time spent on rendering: 50ms" and "06.05.2008 11:18:43 oracle.sdoovis DEMapMaker clear".
- Status Bar:** At the very bottom, it shows "MapViewer Scale (per screen inch): 5.363,514 Ratio Scale: 1:211.162 (X: 281.557,849576) (Y: 5.518.870,974576)".

Visualisierung der Rasterdaten

MapViewer / Oracle MAPS



Oracle Maps und Rasterdaten

Wissenswertes ...

- Java Advanced Imaging (JAI) Libraries
 - Einbindung in den CLASSPATH
jai_core.jar, jai_codec.jar
 - Datenbank oder App.-Server Installation
- Rasterdaten müssen georeferenziert sein
 - ESRI World Files (.tfw)
 - SDO_GEOR.georeference()
- Indizierung der Spatial Footprints
 - SDO_GEORASTER.SPATIALEXTENT
- Auflösungspyramiden (Performance)



Rasterkacheln: Einrichten des Map Cache

- Map Cache-Erstellung analog zu Vektordaten
- Transparenter Hintergrund ist wichtig
 - Auf SRID der Rasterkacheln achten
 - Umprojektion zur Laufzeit aufwändiger
 - Qualitätsverlust beachten

Create a map cache instance

Name:
This name will be automatically prefixed with datasrc name.

Data Source:

Base map:

Background:
 transparent

Cache storage:
Specify the root directory for cached image files.

Zoom Levels:

Minimum Map Scale:
use ratio format, e.g., enter 1000 for a scale of 1:1000

Maximum Map Scale:
the scale when viewing all areas of your data

SRID:
Maps will be displayed in this SRID

Rasterdaten in Oracle MAPS

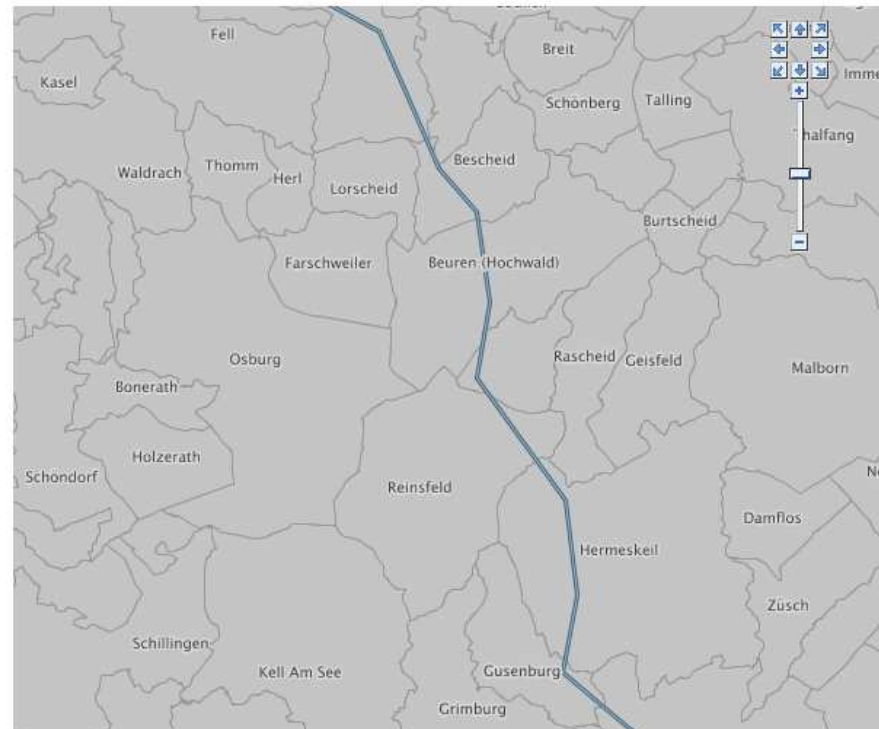
- 1. Karte ohne Rasterkacheln: Vektordaten

Kunden ...

NAME
<u>Fritz Muster</u>
<u>Freie Tanke</u>
<u>Wowereit</u>
<u>Eifel Power II</u>
<u>Carsten Czarski</u>
<u>Marhoui</u>
<u>Tankstelle Lichtenrade</u>
<u>Klaus Weber</u>
<u>Karl Hunsrück</u>
<u>Tankstelle Schönefeld</u>
<u>Tankstelle Dreieck Havelland</u>
<u>Patenge</u>
<u>Carsten C.</u>
<u>ETKUYMV28H</u>
<u>Freie Tankstelle</u>

1 - 15

Karte ...



Rasterdaten in Oracle MAPS

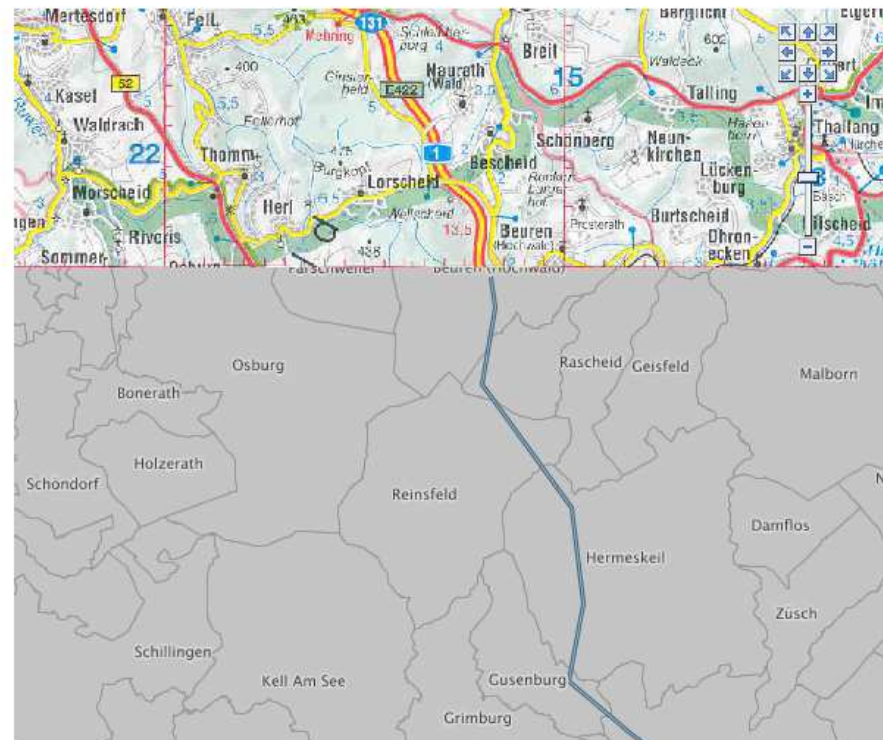
- 1. Eingebblendete Rasterkacheln

Kunden ...

NAME
Fritz Muster
Freie Tanke
Wowereit
Eifel Power II
Carsten Czarski
Marhoul
Tankstelle Lichtenrade
Klaus Weber
Karl Hunsrück
Tankstelle Schönefeld
Tankstelle Dreieck Havelland
Patenge
Carsten C.
ETKUJMV28H
Freie Tankstelle

1 - 15

Karte ...





Q U E S T I O N S
A N S W E R S