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Netezza Spatial Package Reference Guide

Part Number 00J2350-03 Rev. 2

Note: Before using this information and the product that it supports, read the information in "Notices and Trademarks" on page 113.

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Preface

This guide describes the IBM Netezza Spatial Package.

Audience for This Guide

This guide is written for developers who intend to use the IBM Netezza Spatial Package with their IBM Netezza systems. This guide does not provide a tutorial on spatial concepts; for more information, see the *Netezza Spatial Package User's Guide*. Depending on your needs, you should be very familiar with spatial analysis and the OpenGIS standards. You should also be familiar with the basic operation of the IBM Netezza system.

Purpose of This Guide

This guide describes the IBM Netezza Spatial Package. The Package provides spatial analysis functions that can be used on the IBM Netezza database warehouse appliance.

Conventions

Note on Terminology: The terms User-Defined Analytic Process (UDAP) and Analytic Executable (AE) are synonymous.

The following conventions apply:

- *Italics* for emphasis on terms and user-defined values, such as user input.
- Upper case for SQL commands, for example, INSERT or DELETE.
- Bold for command line input, for example, **nzsystem stop**.
- Bold to denote parameter names, argument names, or other named references.
- Angle brackets (< >) to indicate a placeholder (variable) that should be replaced with actual text, for example, **nzmat <- nz.matrix("<matrix_name>")**.
- A single backslash ("\") at the end of a line of code to denote a line continuation. Omit the backslash when using the code at the command line, in a SQL command, or in a file.
- When referencing a sequence of menu and submenu selections, the ">" character denotes the different menu options, for example *Menu Name > Submenu Name > Selection*.

If You Need Help

If you are having trouble using the IBM Netezza appliance, IBM Netezza Analytics or any of its components:

1. Retry the action, carefully following the instructions in the documentation.
2. Go to the IBM Support Portal at http://www.ibm.com/support. Log in using your IBM ID and password. You can search the Support Portal for solutions. To submit a support request, click the 'Service Requests & PMRs' tab.
3. If you have an active service contract maintenance agreement with IBM, you can contact customer support teams via telephone. For individual countries, please visit the Technical

Support section of the IBM Directory of worldwide contacts:
http://www14.software.ibm.com/webapp/set2/sas/f/handbook/contacts.html#phone.

Comments on the Documentation

We welcome any questions, comments, or suggestions that you have for the IBM Netezza documentation. Please send us an e-mail message at netezza-doc@wwpdl.vnet.ibm.com and include the following information:

- The name and version of the manual that you are using
- Any comments that you have about the manual
- Your name, address, and phone number

We appreciate your comments.

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CHAPTER 2
Reference Documentation: Spatial

ST_Area - Area of the Geometry

Determines the area of the specified geometry object having a surface.

Usage

The ST_Area function has the following syntax:

- **ST_Area(VARCHAR(ANY) ST_Geometry, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry**
      The geometry object.

      Type: VARCHAR(ANY)
    - **unit**
      The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

      Type: VARCHAR(ANY)

      Default: 'meter'
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: From geometry's SRID or 'WGS84' if geometry has no SRID.
  - Returns
    DOUBLE The area of the specified geometry object.

Details

This function returns the area of the specified geometry object (in WKB format) having a surface:

polygon, multipolygon, geometry collection. SRID and units are supported. In the cartesian case, this function returns an accurate value. In the spherical case, the area is calculated by dividing the geometry into spherical triangles and calculating their areas using spherical excess / Huiller's formula. It deals with geometries that cross the 180 meridian or contain the pole. In the spheroidal case, the geometry is projected into a cartesian coordinate system by Behrmann Equal Area projection and its area is calculated in the same way as the cartesian case.

Examples

```
SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1
2, 2 2, 2 1, 1 1))', 1234));
 ST_AREA
---------
       1
(1 row)


SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1
2, 2 2, 2 1, 1 1))', 1111));
     ST_AREA
-----------------
 12367196844.731
(1 row)


SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1
2, 2 2, 2 1, 1 1))', 4326));
     ST_AREA
-----------------
 12304814950.073
(1 row)


SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1
2, 2 2, 2 1, 1 1))', 1234), 'foot');
    ST_AREA
----------------
 10.76391041671
(1 row)
```

```
SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1 2, 2 2,
2 1, 1 1))', 1234), 'meter', 'sphere');

     ST_AREA

-----------------

 12367196844.731

(1 row)
```

```
SELECT inza..ST_Area(inza..ST_WKTToSQL('POLYGON((1 1, 1 2, 2 2,
2 1, 1 1))'), 'meter', 1111);

     ST_AREA

-----------------

 12367196844.731

(1 row)
```

Related Functions

- category Spatial

ST_AsBinary - Well-known Binary Representation of the Geometry

Determines the Well-Known Binary (WKB) representation of a geometry object without the SRID.

Usage

The ST_AsBinary function has the following syntax:

- **ST_AsBinary(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      The geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The Well-Known Binary (WKB) representation of a geometry object without the SRID.

Details

Takes a geometry object and returns its well-known binary representation. ST_AsBinary is the reverse of ST_WKBToSQL.

Examples

```
SELECT
inza..ST_AsText(inza..ST_WKBToSQL(inza..ST_AsBinary(inza.
.ST_Point(1, 2))));
```

```
ST_ASTEXT
-----------
 POINT (1 2)
(1 row)
```

Related Functions

- category Spatial
- ST_AsText
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKBToSQL
- ST_WKTToSQL

ST_AsKML - KML representation of a Geometry

Returns the Keyhole Markup Language (KML) representation of a geometry object.

Usage

The ST_AsKML function has the following syntax:

- **ST_AsKML(VARCHAR(ANY) ST_Geometry); VARCHAR(ANY) = ST_AsKML(VARCHAR(ANY) ST_Geometry, VARCHAR(ANY) additionalKMLAttributes);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **additionalKMLAttributes**
      (Optional) Select one of <extrude>, <tessellate> or <altitudeMode>.

      Type: VARCHAR(ANY)

      Default: ''
  - Returns
    VARCHAR(ANY) The Keyhole Markup Language (KML) representation of a geometry object.

Details

The "additionalKMLAttributes" are not validated and are simply added to the output.

Examples

```
SELECT inza..ST_AsKML(inza..ST_Point(1, 5));
 ST_ASKML
 ----------
 <Point><coordinates>1,5</coordinates></Point>
(1 row)


SELECT inza..ST_AsKML(inza..ST_Point(1, 5),
'<extrude>1</extrude><altitudeMode>clampToGround</altitudeMode>'
);
ST_ASKML
----------
 <Point><extrude>1</extrude><altitudeMode>clampToGround</altitu
deMode><coordinates>1,5</coordinates></Point>
(1 row)
```

Related Functions

- category Spatial

ST_AsText - WKT representation of a Geometry

Returns the Well-Known Text (WKT) representation of a geometry object.

Usage

The ST_AsText function has the following syntax:

- **ST_AsText(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The Well-Known Text (WKT) representation of a geometry object.

Details

Does not return the SRID. ST_AsText is the reverse of ST_GeomFromText.

Examples

```
select inza..ST_AsText(inza..ST_Point(1.0, 5.0));
ST_ASTEXT
-----------
 POINT (1 5)
(1 row)

select inza..ST_AsText(inza..ST_WKTToSQL('POLYGON((10 10,
10 20, 20 20, 20 15, 10 10))'));
ST_ASTEXT
-----------
 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKTToSQL
- ST_WKBToSQL
- ST_AsBinary

ST_Boundary - Boundary of the Geometry

Determines the boundary of a geometry object.

Usage

The ST_Boundary function has the following syntax:

- **ST_Boundary(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)

- Returns
  VARCHAR(ANY) A geometry object.

Details

ST_Boundary takes a geometry object and returns its combined boundary as a geometry object.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Boundary(inza..ST_WKTToSQL('POLYGON ((1
1, 1 2, 2 2, 2 1, 1 1))')));

ST_ASTEXT

-----------

 LINESTRING (1 1, 1 2, 2 2, 2 1, 1 1)

(1 row)


SELECT
inza..ST_AsText(inza..ST_Boundary(inza..ST_WKTToSQL('LINESTRING
(0 0, 1 1, 2 2)')));

ST_ASTEXT

-----------

 MULTIPOINT (0 0, 2 2)

(1 row)
```

Related Functions

- category Spatial

ST_Buffer - Buffer around the Geometry

Determines a buffer region around the specified geometry having the width specified by the distance parameter and a number of segments used to approximate a quarter of a circle.

Usage

The ST_Buffer function has the following syntax:

- **ST_Buffer(VARCHAR(ANY) ST_Geometry, DOUBLE distance, INT nSegments, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

Type: VARCHAR(ANY)

- **distance**
  The buffer distance.

  Type: DOUBLE

- **nSegments**
  The number of segments used to approximate a quarter of a circle.

  Type: INT

  Default: 8

- **unit**
  The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

  Type: VARCHAR(ANY)

  Default: 'meter'

- **cSystem**
  The coordinate system.

  Type: VARCHAR(ANY)

  Default: From geometry's SRID or 'WGS84' if geometry has no SRID.

▲ Returns
VARCHAR(64000) A geometry object that is a buffer region around the specified geometry.

Details

This function supports only points using the spherical and WGS84 coordinate systems.

Examples

```
SELECT inza..ST_AsText(inza..ST_Buffer(inza..ST_Point(0,
0, 1234), 1, 2));

ST_ASTEXT

-----------

 POLYGON ((1 0, 0.707106781186548 -0.707106781186547,
1.61554255216634e-15 -1, -0.707106781186546
-0.707106781186549, -1 -3.23108510433268e-15,
-0.70710678118655 0.707106781186545, -4.62458305157398e-
15 1, 0.707106781186544 0.707106781186551, 1 0))

 (1 row)


SELECT inza..ST_AsText(inza..ST_Buffer(inza..ST_Point(0,
0, 1234), 1, 2, 'foot'));

ST_ASTEXT
```

```
-----------

 POLYGON ((0.3048 0, 0.21552614690566 -0.21552614690566,
4.924173699003e-16 -0.3048, -0.215526146905659
-0.21552614690566, -0.3048 -9.848347398006e-16,
-0.215526146905661 0.215526146905659, -1.40957291411975e-15
0.3048, 0.215526146905658 0.215526146905661, 0.3048 0))

 (1 row)
```

```
SELECT inza..ST_AsText(inza..ST_Buffer(inza..ST_Point(0, 0,
1234), 1, 2, 'meter', 'wgs84'));

ST_ASTEXT

-----------

 POLYGON ((0 9.04366924787139e-06, 6.35204378055173e-06
6.39485337411952e-06, 8.98315284119521e-06 5.53748303899457e-
22, 6.35204378055173e-06 -6.39485337411952e-06,
1.1000794896585e-21 -9.04366924787139e-06, -6.35204378055173e-
06 -6.39485337411952e-06, -8.98315284119521e-06
-1.66124491169837e-21, -6.35204378055173e-06 6.39485337411952e-
06, 0 9.04366924787139e-06))

 (1 row)
```

Related Functions

- category Spatial

ST_Centroid - Centroid of the Geometry

Determines the geometric center of a geometry object.

Usage

The ST_Centroid function has the following syntax:

- **ST_Centroid(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(100) A point geometry object.

Details

The geometric center of the geometry is the "average" of the points in the geometry. The result is not guar-

anteed to be on the geometry. If the geometry is empty, then an empty point is returned.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Centroid(inza..ST_WKTToSQL('LINE
STRING (0 0, 10 0)')));

ST_ASTEXT

-----------

 POINT (5 0)

(1 row)


SELECT
inza..ST_AsText(inza..ST_Centroid(inza..ST_WKTToSQL('POLY
GON ((10 10, 10 20, 20 20, 20 15, 10 10))')));

ST_ASTEXT

-----------

 POINT (14.4444444444444 16.1111111111111)

(1 row)
```

Related Functions

- category Spatial

ST_Collect - Collect multiple point geometries and generate a multipoint geometry from it

Creates a multipoint geometry from a table of points

Usage

The ST_Collect aggregate has the following syntax:

- **ST_Collect(VARCHAR(ANY) geometry);**
  - Parameters
    - **geometry**
      A point geometry object.

      Type: VARCHAR(ANY)
  - Returns

VARCHAR(ANY) The multipoint geometry object.

Examples

```
CREATE TABLE points (PointID integer, the_geom varchar(200));

INSERT INTO points VALUES (1, inza..ST_WKTToSQL('Point (0 0)'));

INSERT INTO points VALUES (2, inza..ST_WKTToSQL('Point (22
0)'));

INSERT INTO points VALUES (3, inza..ST_WKTToSQL('Point (33
33)'));

INSERT INTO points VALUES (4, inza..ST_WKTToSQL('Point (44
44)'));

SELECT inza..ST_AsText(inza..ST_Collect(the_geom)) from (SELECT
the_geom from points order by PointID LIMIT 9999999) points;

DROP TABLE points;

                ST_ASTEXT
----------------------------------------

 MULTIPOINT (0 0, 22 0, 33 33, 44 44)

(1 row)
```

Related Functions

- category Spatial

ST_Collect - Collect multiple point geometries from a table and generate a table of multipoint geometries from it

Creates a table of multipoint geometries from a table of points

Usage

The ST_Collect table function has the following syntax:

- **ST_Collect(VARCHAR(ANY) Varchar);**
  - Parameters
    - **VARCHAR**
      A point geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The multipoint geometry object named "multipoint".

Examples

```
CREATE TABLE trip_points (trip_id integer, geom
varchar(200), timestamp integer);

INSERT INTO trip_points VALUES (100,
inza..ST_WKTToSQL('Point (100 100)'), 120212);

INSERT INTO trip_points VALUES (100,
inza..ST_WKTToSQL('Point (200 200)'), 120312);

INSERT INTO trip_points VALUES (100,
inza..ST_WKTToSQL('Point (300 300)'), 120412);

INSERT INTO trip_points VALUES (100,
inza..ST_WKTToSQL('Point (400 400)'), 120512);

INSERT INTO trip_points VALUES (200,
inza..ST_WKTToSQL('Point (200 200)'), 120212);

INSERT INTO trip_points VALUES (200,
inza..ST_WKTToSQL('Point (300 300)'), 120312);

INSERT INTO trip_points VALUES (200,
inza..ST_WKTToSQL('Point (100 100)'), 120412);

INSERT INTO trip_points VALUES (200,
inza..ST_WKTToSQL('Point (400 400)'), 120512);

INSERT INTO trip_points VALUES (300,
inza..ST_WKTToSQL('Point (400 400)'), 120212);

INSERT INTO trip_points VALUES (300,
inza..ST_WKTToSQL('Point (300 300)'), 120312);

INSERT INTO trip_points VALUES (300,
inza..ST_WKTToSQL('Point (200 200)'), 120412);

INSERT INTO trip_points VALUES (300,
inza..ST_WKTToSQL('Point (100 100)'), 120512);

select trip_id, inza..st_astext(tf.multipoint) from
(select inza..st_astext(geom), geom, trip_id, lag(0,1,1)
over (partition by trip_id order by timestamp) as
begin_part, lead(0,1,1) over(partition by trip_id order
by timestamp) as end_part from trip_points) as foo, table
with final(inza..st_collect(geom, begin_part, end_part))
tf order by trip_id;

DROP TABLE trip_points;
```

```
 TRIP_ID |                    ST_ASTEXT
---------
+-----------------------------------------------

     100 | MULTIPOINT (100 100, 200 200, 300 300, 400
```

```
400)
     200 | MULTIPOINT (200 200, 300 300, 100 100, 400 400)
     300 | MULTIPOINT (400 400, 300 300, 200 200, 100 100)
(3 rows)
```

Related Functions

- category Spatial

ST_Contains - Checks Containment of Two Geometries

Determines whether the first specified geometry contains the second geometry.

Usage

The ST_Contains function has the following syntax:

- **ST_Contains(VARCHAR(ANY) ST_Geometry1, ARCHAR(ANY) ST_Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL TRUE if the first geometry contains the second geometry; otherwise FALSE.

Details

ST_Contains is the reverse of ST_Within. The current implementation performs calculations treating all co-ordinate systems as cartesian.

Examples

```
SELECT inza..ST_Contains(inza..ST_WKTToSQL('POLYGON ((0 0, 11 0,
11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON ((10 10, 10 20,
20 20, 20 15, 10 10))'));
ST_CONTAINS
-------------
 f
(1 row)
```

```
SELECT inza..ST_Contains(inza..ST_WKTToSQL('POLYGON ((0
0, 110 0, 110 110, 0 110, 0 0))'),
inza..ST_WKTToSQL('POLYGON ((10 10, 10 20, 20 20, 20 15,
10 10))'));

ST_CONTAINS
-------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Relate
- ST_Within

ST_ConvexHull - Convex Hull of a Geometry

Determines the smallest convex geometry that contains all of the points of the specified geometry object.

Usage

The ST_ConvexHull function has the following syntax:

- **ST_ConvexHull(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) A geometry object.

Examples

```
SELECT
inza..ST_AsText(inza..ST_ConvexHull(inza..ST_WKTToSQL('PO
INT (0 0)')));

ST_ASTEXT
-----------
 POINT (0 0)
(1 row)
```

```
SELECT
inza..ST_AsText(inza..ST_ConvexHull(inza..ST_WKTToSQL('LINESTRIN
G (0 0, 10 10, 20 10, 30 10)')));
```

```
ST_ASTEXT
-----------
 POLYGON ((0 0, 10 10, 30 10, 0 0))
(1 row)
```

```
SELECT
inza..ST_AsText(inza..ST_ConvexHull(inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));
```

```
ST_ASTEXT
-----------
 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)
```

Related Functions

- category Spatial

ST_CoordDim - Coordinate Dimension

Determines the coordinate dimension the geometry object.

Usage

The ST_CoordDim function has the following syntax:

- **ST_CoordDim(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    INT If the geometry only has x and y coordinates, then 2 is returned. If the geometry additionally has z or m, then 3 is returned. If the geometry has x, y, z and m coordinates, then 4 is returned. If the geometry is empty, 2 is returned.

Examples

```
SELECT inza..ST_CoordDim(inza..ST_WKTToSQL('POINT (0 0)'));
```

```
ST_COORDDIM
-------------
           2
(1 row)
```

```
SELECT inza..ST_CoordDim(inza..ST_WKTToSQL('POINT (0 0
0)'));
ST_COORDDIM
-------------
           3
(1 row)
```

Related Functions

- category Spatial

ST_Crosses - Checks if Geometries Cross

Determines if the first specified geometry crosses the second geometry.

Usage

The ST_Crosses function has the following syntax:

- **ST_Crosses(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the first geometry crosses the second geometry; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is T*T****** or, for two lines, 0********. The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Crosses(inza..ST_WKTToSQL('LINESTRING (0 0, 10
10)'), inza..ST_WKTToSQL('LINESTRING (0 5, 10 5)'));
 ST_CROSSES
------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Relate

ST_Difference - Difference of Two Geometries

Detemines which points in the first specified geometry are not in the second geometry.

Usage

The ST_Difference function has the following syntax:

- **ST_Difference(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) Returns a geometry object representing the points in the first geometry that are not in the second geometry.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Difference(inza..ST_WKTToSQL('POLYGON
((0 0, 11 0, 11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));
ST_ASTEXT
-----------
 POLYGON ((11 10.5, 11 0, 0 0, 0 11, 10 11, 10 10, 11 10.5))
```

```
(1 row)
```

Related Functions

- category Spatial

ST_Dimension - Dimension of the geometry

Determines the dimension of a geometry object. Note that the returned dimension is not the coordinate dimension.

Usage

The ST_Dimension function has the following syntax:

- **ST_Dimension(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    INT Returns 0 for point, 1 for lines, 2 for polygons, or the highest dimension of the contents of a geometry collection; returns -1 for an empty geometry collection.

Examples

```
SELECT inza..ST_Dimension(inza..ST_WKTToSQL('POINT (0
0)'));
 ST_DIMENSION
--------------
            0
(1 row)

SELECT inza..ST_Dimension(inza..ST_WKTToSQL('LINESTRING
(0 0, 1 1)'));
 ST_DIMENSION
--------------
            1
(1 row)
```

```
SELECT inza..ST_Dimension(inza..ST_WKTToSQL('POLYGON ((1 1, 1 2,
2 2, 2 1, 1 1))'));
 ST_DIMENSION
--------------
            2
(1 row)
```

Related Functions

- category Spatial
- ST_CoordDim

ST_Disjoint - Checks if Geometries are Disjoint

Determines if the two specified geometries do not intersect.

Usage

The ST_Disjoint function has the following syntax:

- **ST_Disjoint(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL TRUE if the two geometries do not intersect; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is FF*FF****. The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Disjoint(inza..ST_WKTToSQL('LINESTRING (0 0, 10
10)'), inza..ST_WKTToSQL('LINESTRING (0 5, 10 5)'));
 ST_DISJOINT
-------------
```

```
 f
(1 row)
```

Related Functions

- category Spatial
- ST_Intersects
- ST_Relate

ST_Distance - Distance between Geometries

Determines the minimum distance between two points or segments.

Usage

The ST_Distance function has the following syntax:

- **ST_Distance(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem, BOOL intersectTest);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
    - **unit**
      The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

      Type: VARCHAR(ANY)

      Default: 'meter'
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: From geometry's SRID or 'WGS84' if geometry has no SRID.
    - **intersectTest**
      (Optional) If enabled, tests for intersection between the geometries and returns 0 if they do. Otherise, calculate distance between the geometries.

      Type: BOOL

      Default: TRUE

- Returns
  DOUBLE Returns distance as the minimum distance between two points or segments describing the two ST_Geometry values.

Details

This function returns the minimum distance from any points or segments describing one geometry, ST_Geometry1, to any points or segments describing a second geometry, ST_Geometry2. SRID support.

Examples

```
SELECT inza..ST_Distance(inza..ST_Point(0, 0, 1234),
inza..ST_Point(1, 0, 1234));
 ST_DISTANCE
-------------
           1
(1 row)


SELECT inza..ST_Distance(inza..ST_Point(0, 0, 1234),
inza..ST_Point(1, 0, 1234), 'foot');
   ST_DISTANCE
-----------------
 3.2808398950131
(1 row)


SELECT inza..ST_Distance(inza..ST_Point(0, 0, 1234),
inza..ST_Point(1, 0, 1234), 'meter', 'wgs84');
   ST_DISTANCE
-----------------
 111319.49079323
(1 row)
```

Related Functions

- category Spatial

ST_DWithin - Distance Within

Determines whether two geometries are within the specified distance of one another.

Usage

The ST_DWithin function has the following syntax:

- **ST_DWithin(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2, DOUBLE distance, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
    - **distance**
      The distance within which the geometries must be.

      Type: DOUBLE
    - **unit**
      The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

      Type: VARCHAR(ANY)

      Default: 'meter'
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: From geometry's SRID or 'WGS84' if geometry has no SRID.
  - Returns
    BOOL Returns TRUE if the geometries are within the specified distance of one another; otherwise FALSE.

Examples

```
SELECT inza..ST_DWithin(inza..ST_Point(0,0),
inza..ST_Point(1,1), 2, 'meter', 'cartesian');
 ST_DWITHIN
------------
 t
(1 row)


SELECT inza..ST_DWithin(inza..ST_Point(0,0),
```

```
inza..ST_Point(1,1), 2, 'foot', 'cartesian');
 ST_DWITHIN
------------
 f
(1 row)

SELECT inza..ST_DWithin(inza..ST_Point(0,0),
inza..ST_Point(1,1), 2, 'meter', 'wgs84');
 ST_DWITHIN
------------
 f
(1 row)
```

Related Functions

- category Spatial

ST_Ellipse - Ellipse Constructor

Specifies an ellipse with the specified center, axes, and tilt.

Usage

The ST_Ellipse function has the following syntax:

- **ST_Ellipse(DOUBLE x0, DOUBLE y0, DOUBLE a, DOUBLE b, DOUBLE tilt, INT nSegment, VARCHAR(ANY) unit, VARCHAR(ANY) cSystems); VARCHAR(64000) = ST_Ellipse(VARCHAR(ANY) ST_Geometry, DOUBLE a, DOUBLE b, DOUBLE tilt, INT nSegments, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **x0**
      The longtitude or the x-coordinate of the center.

      Type: DOUBLE
    - **y0**
      The latitude or the y-coordinate of the center.

      Type: DOUBLE
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **a**

The semi-major axis.

Type: DOUBLE

- **b**
  The semi-minor axis.

  Type: DOUBLE

- **tilt**
  The major axis tilt.

  Type: DOUBLE

- **nSegments**
  The number of segments used to approximate a quarter of a circle.

  Type: INT

  Default: 8

- **unit**
  The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

  Type: VARCHAR(ANY)

  Default: 'meter'

- **cSystem**
  The coordinate system.

  Type: VARCHAR(ANY)

  Default: 'WGS84'

- Returns
  VARCHAR(64000) Returns an ellipse (polygon) with the specified center, axes, and tilt.

Examples

```
SELECT inza..ST_AsText(inza..ST_Ellipse(1.0, 2.0, 100.0,
50.0, 30.0, 2, 'meter', 'cartesian'));

ST_ASTEXT

------------

 POLYGON ((51 88.6025403784439, 66.9739608441171
45.5595740399158, 44.3012701892219 -23, -3.73671727453765
-76.9149130992431, -49 -84.6025403784439,
-64.9739608441171 -41.5595740399158, -42.3012701892219
27, 5.73671727453765 80.9149130992431, 51
88.6025403784439))

(1 row)
```

```
SELECT inza..ST_AsText(inza..ST_Ellipse(inza..st_wkttosql('point
(1.0 2.0)'), 100.0, 50.0, 30.0, 2, 'meter', 'cartesian'));

ST_ASTEXT

-----------

 POLYGON ((51 88.6025403784439, 66.9739608441171
45.5595740399158, 44.3012701892219 -23, -3.73671727453765
-76.9149130992431, -49 -84.6025403784439, -64.9739608441171
-41.5595740399158, -42.3012701892219 27, 5.73671727453765
80.9149130992431, 51 88.6025403784439))

(1 row)
```

Related Functions

- category Spatial

ST_EndPoint - End Point of a Line

Determines the last point of a line.

Usage

The ST_EndPoint function has the following syntax:

- **ST_EndPoint(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a line.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(100) The point geometry object; NULL if no end point.

Examples

```
SELECT
inza..ST_AsText(inza..ST_EndPoint(inza..ST_WKTToSQL('LINESTRING
(0 0, 1 1, 1 2))')));

ST_ASTEXT

-----------

 POINT (1 2)

(1 row)
```

Related Functions

- category Spatial

ST_Envelope - Bounding Box of a Geometry

Determines the bounding box of a geometry object.

Usage

The ST_Envelope function has the following syntax:

- **ST_Envelope(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(200) The bounding box, or envelope, as a geometry object.

Details

This function always returns a rectangle as a polygon. ST_Envelope is exactly the same as ST_MBR.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Envelope(inza..ST_WKTToSQL('LINE
STRING (0 0, 1 -1, 2 2)')));

ST_ASTEXT

------------

 POLYGON ((0 -1, 0 2, 2 2, 2 -1, 0 -1))

(1 row)
```

Related Functions

- category Spatial
- ST_MBR

ST_Equals - Checks if Geometries are Equal

Determines is two geometries are equal.

Usage

The ST_Equals function has the following syntax:

- **ST_Equals(VARCHAR(ANY) ST_Geometry1, VARCHAR(ANY) ST_Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL TRUE if the two geometries are equal; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is T*F**FFF*.

Examples

```
SELECT inza..ST_Equals(inza..ST_WKTToSQL('LINESTRING (0 0, 10
10)'), inza..ST_WKTToSQL('LINESTRING (0 0, 10 10)'));
 ST_EQUALS
-----------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Relate

ST_Expand - Expanded Bounding Rectangle of a Geometry

Determines the minimum bounding rectangle of a geometry object expanded by the distance parameter.

Usage

The ST_Expand function has the following syntax:

- **ST_Expand(VARCHAR(ANY) ST_Geometry, DOUBLE distance, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry**

A geometry object.

Type: VARCHAR(ANY)

- **distance**
  The distance to expand the bounding box around the input geometry's MBR.

  Type: DOUBLE

- **unit**
  The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

  Type: VARCHAR(ANY)

  Default: 'meter'

- **cSystem**
  The coordinate system.

  Type: VARCHAR(ANY)

  Default: From geometry's SRID or 'WGS84' if the geometry has no SRID.

▲ Returns
VARCHAR(200) A polygon that is the new MBR of the input geometry's MBR, expanded by the specified distance value.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Expand(inza..ST_WKTToSQL('POLYGO
N ((10 10, 10 20, 20 20, 20 15, 10 10))', 1234), 100));
ST_ASTEXT
-----------
 POLYGON ((-90 -90, -90 120, 120 120, 120 -90, -90 -90))
(1 row)


SELECT
inza..ST_AsText(inza..ST_Expand(inza..ST_WKTToSQL('POLYGO
N ((10 10, 10 20, 20 20, 20 15, 10 10))', 1234), 100,
'foot'));
ST_ASTEXT
-----------
 POLYGON ((-20.48 -20.48, -20.48 50.48, 50.48 50.48,
50.48 -20.48, -20.48 -20.48))
(1 row)
```

```
SELECT
inza..ST_AsText(inza..ST_Expand(inza..ST_WKTToSQL('POLYGON ((10
10, 10 20, 20 20, 20 15, 10 10))', 1234), 100, 'meter',
'wgs84'));

ST_ASTEXT

-----------

 POLYGON ((9.99904440725798 9.99909590432257, 9.99904440725798
20.0009033073281, 20.000955592742 20.0009033073281,
20.000955592742 9.99909590432257, 9.99904440725798
9.99909590432257))

(1 row)
```

Related Functions

- category Spatial
- ST_MBR

ST_ExteriorRing - Exterior Ring of a Polygon

Determines the exterior ring from the specified polygon object.

Usage

The ST_ExteriorRing function has the following syntax:

- **ST_ExteriorRing(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(64000) A line geometry object; NULL if the polygon is empty.

Examples

```
SELECT
inza..ST_AsText(inza..ST_ExteriorRing(inza..ST_WKTToSQL('POLYGON
((0 0, 100 0, 100 100, 0 100, 0 0), (10 10, 10 20, 20 20, 20 15,
10 10))')));

ST_ASTEXT

-----------

 LINESTRING (0 0, 100 0, 100 100, 0 100, 0 0)

(1 row)
```

Related Functions

- category Spatial
- ST_InteriorRingN

ST_GeometryN - Nth Geometry from a Geometry Collection

Determines the Nth geometry from a geometry collection.

Usage

The ST_GeometryN function has the following syntax:

- **ST_GeometryN(VARCHAR(ANY) ST_Geometry, INT n);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **n**
      A 1-based index.

      Type: INT
  - Returns
    VARCHAR(ANY) A geometry object; NULL if the specified geometry is not a collection of geometries.

Examples

```
SELECT
inza..ST_AsText(inza..ST_GeometryN(inza..ST_WKTToSQL('GEO
METRYCOLLECTION (POLYGON ((10 10, 10 20, 20 20, 20 15, 10
10)), POINT (5 6))'), 2));
```

```
ST_ASTEXT
-----------
 POINT (5 6)
(1 row)
```

Related Functions

- category Spatial

ST_GeometryType - Type of a Geometry

Determines the geometry type of the geometry object.

Usage

The ST_GeometryType function has the following syntax:

- **ST_GeometryType(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(50) The geometry type of the geometry object as a string.

Examples

```
SELECT inza..ST_GeometryType(inza..ST_WKTToSQL('POINT (0 0)'));
 ST_GEOMETRYTYPE
-----------------
 ST_POINT
(1 row)
```

```
SELECT inza..ST_GeometryType(inza..ST_WKTToSQL('POLYGON ((10 10,
10 20, 20 20, 20 15, 10 10))'));
 ST_GEOMETRYTYPE
-----------------
 ST_POLYGON
(1 row)
```

Related Functions

- category Spatial
- ST_GeometryTypeID

ST_GeometryTypeID - Geometry Type of a Geometry

Determines the geometry type of the geometry object according to the OGC standard.

Usage

The ST_GeometryTypeID function has the following syntax:

- **ST_GeometryTypeID(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    INT The geometry type of the geometry object as a number.

Examples

```
SELECT inza..ST_GeometryTypeID(inza..ST_WKTToSQL('POINT
(0 0)'));
 ST_GEOMETRYTYPEID
-------------------
                 1
(1 row)

SELECT inza..ST_GeometryTypeID(inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))'));
 ST_GEOMETRYTYPEID
-------------------
                 3
(1 row)
```

Related Functions

- category Spatial
- ST_GeometryType

ST_GeomFromText - Geometry from WKT Representation

Determines a geometry object from the Well-Known Text (WKT) representation.

Usage

The ST_GeomFromText function has the following syntax:

- **ST_GeomFromText(VARCHAR(ANY) WKTString); VARCHAR(ANY) =**

ST_GeomFromText(VARCHAR(ANY) WKTSTring,INT4 Srid); VARCHAR(ANY) = ST_GeomFromText(VARCHAR(ANY),INT4 Srid, BOOL ComputeMBR);

- Parameters
  - **ST_Geometry**
    A geometry object.

    Type: VARCHAR(ANY)
  - **SRID**
    The Spatial Reference System Identifier.

    Type: INT4

    Default: 4326
  - **computeMBRFlag**
    (Optional) Indicates whether the MBR should be computed.

    Type: BOOL

    Default: TRUE
- Returns
  VARCHAR(ANY) A geometry object.

Details

ST_GeomFromWKT is exactly the same as ST_WKTToSQL. ST_WKTToSQL is the reverse of ST_AsText.

Examples

```
SELECT inza..ST_GeomFromText('POLYGON ((10 10, 10 20, 20 20, 20
15, 10 10))');
 ST_GEOMFROMTEXT
-----------------
 g
(1 row)


SELECT inza..ST_GeomFromText('POLYGON ((10 10, 10 20, 20 20, 20
15, 10 10))', 4326);
 ST_GEOMFROMTEXT
-----------------
 g
(1 row)


SELECT inza..ST_ASTEXT(inza..ST_GeomFromText('POLYGON ((10 10,
10 20, 20 20, 20 15, 10 10))', 4326, true));
ST_ASTEXT
```

```
------------
 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)
```

Related Functions

- category Spatial
- ST_WKTToSQL
- ST_GeomFromWKB
- ST_WKBToSQL
- ST_AsText
- ST_AsBinary

ST_GeomFromWKB - Geometry from WKB Representation

Determines a geometry object from the Well-Known Binary (WKB) representation.

Usage

The ST_GeomFromWKB function has the following syntax:

- **ST_GeomFromWKB(VARCHAR(ANY) WKB); VARCHAR(ANY) = ST_GeomFromWKB(VARCHAR(ANY) WKB, INT4 Srid); VARCHAR(ANY) = ST_GeomFromWKB(VARCHAR(ANY) WKB, INT4 Srid, BOOL ComputeMBR);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **SRID**
      The Spatial Reference System Identifier.

      Type: INT4

      Default: 4326
    - **computeMBRFlag**
      Indicates whether the MBR should be computed.

      Type: BOOL

      Default: TRUE
  - Returns
    VARCHAR(ANY) A geometry object.

Details

ST_GeomFromWKB is exactly the same as ST_WKBToSQL. ST_WKBToSQL is the reverse of ST_AsBinary.

Examples

```
select
inza..ST_AsText(inza..ST_GeomFromWKB(inza..ST_AsBinary(inza..ST_
WKTToSQL('POLYGON ((0 0, 11 0, 11 11, 0 11, 0 0))'))));

ST_ASTEXT
-------------------------------------------------------------------
-------------------------------------------------------------------
-------------------------------------------------------------------
----------------------
 POLYGON ((0 0, 11 0, 11 11, 0 11, 0 0))
(1 row)

select
inza..ST_AsText(inza..ST_GeomFromWKB(inza..ST_AsBinary(inza..ST_
WKTToSQL('LINESTRING(0 0, 3 4, -1 1)'))));

                                                                ST
_ASTEXT
-------------------------------------------------------------------
-------------------------------------------------------------------
-----
 LINESTRING (0 0, 3 4, -1 1)
(1 row)

select
inza..ST_AsText(inza..ST_GeomFromWKB(inza..ST_AsBinary(inza..ST_
Point(1, 5))));
ST_ASTEXT
-----------
 POINT (1 5)
(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_WKBToSQL

- ST_WKTToSQL
- ST_AsText
- ST_AsBinary

ST_GrandMBR - Bounding Box from a Set of Geometries

Determines the bounding box from a set of geometry objects.

Usage

The ST_GrandMBR function has the following syntax:

- **ST_GrandMBR(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(200) The bounding box as a geometry object.

Examples

```
CREATE TABLE polygons (PointID integer, the_geom
varchar(200));

INSERT INTO polygons VALUES (1,
inza..ST_WKTToSQL('Polygon ((0 0, 11 0, 11 11, 0 11, 0
0))'));

INSERT INTO polygons VALUES (2,
inza..ST_WKTToSQL('Polygon ((0 0, 22 0, 22 22, 0 22, 0
0))'));

INSERT INTO polygons VALUES (3,
inza..ST_WKTToSQL('Polygon ((0 0, 33 0, 33 33, 0 33, 0
0))'));

INSERT INTO polygons VALUES (4,
inza..ST_WKTToSQL('Polygon ((0 0, 44 0, 44 44, 0 44, 0
0))'));

SELECT inza..ST_AsText(inza..ST_GrandMBR(the_geom)) from
polygons;

DROP TABLE polygons;


ST_ASTEXT

--------------------------------------------------------
```

```
-------------------------------------------------------------------
-------------------------------------------------------------------
---------------------------

 POLYGON ((0 0, 0 44, 44 44, 44 0, 0 0))

(1 row)
```

Related Functions

- category Spatial
- ST_MBR

ST_InteriorRingN - Nth Interior Ring from the Polygon

Determines the Nth interior ring from the specified polygon object.

Usage

The ST_InteriorRingN function has the following syntax:

- **ST_InteriorRingN(VARCHAR(ANY) Geometry, INT4 N);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **N**
      A 1-based index.

      Type: INT4
  - Returns
    VARCHAR(ANY) A line geometry object; NULL if the Nth interior ring is not found.

Examples

```
SELECT
inza..ST_AsText(inza..ST_InteriorRingN(inza..ST_WKTToSQL('POLYGO
N ((0 0, 100 0, 100 100, 0 100, 0 0), (10 10, 10 20, 20 20, 20
15, 10 10))'), 1));

ST_ASTEXT

-----------

 LINESTRING (10 10, 10 20, 20 20, 20 15, 10 10)

(1 row)


SELECT inza..ST_InteriorRingN(inza..ST_WKTToSQL('Polygon ((10
10, 10 20, 20 20, 20 15, 10 10))'), 5);
```

```
 ST_INTERIORRINGN
------------------
(1 row)
```

Related Functions

- category Spatial
- ST_ExteriorRing

ST_Intersection - Create a geometry that is the union of a table of geometries.

Creates a geometry by doing a union on a table of geometries

Usage

The ST_Intersection aggregate has the following syntax:

- **ST_Intersection(VARCHAR(ANY) geometry);**
  - Parameters
    - **geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The unified geometry object.

Examples

```
CREATE TABLE points (PointID integer, the_geom
VARCHAR(200));

INSERT INTO points VALUES (1, inza..ST_WKTToSQL('Point (0
0)'));

INSERT INTO points VALUES (2, inza..ST_WKTToSQL('Point
(22 0)'));

INSERT INTO points VALUES (3, inza..ST_WKTToSQL('Point
(33 33)'));

INSERT INTO points VALUES (4, inza..ST_WKTToSQL('Point
(44 44)'));

SELECT inza..ST_AsText(inza..ST_Intersection(the_geom))
from (SELECT the_geom from points order by PointID LIMIT
9999999) points;
```

```
DROP TABLE points;
                ST_ASTEXT
---------------------------------------
 GEOMETRYCOLLECTION EMPTY
(1 row)
```

Related Functions

- category Spatial

ST_Intersection - Intersection of Geometries

Determines a geometry object representing the points shared by the specified geometries.

Usage

The ST_Intersection function has the following syntax:

- **ST_Intersection(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The shared geometry object. The geometry object may be empty if no points are shared.

Details

The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Intersection(inza..ST_WKTToSQL('POLYGON
((0 0, 11 0, 11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));
ST_ASTEXT
-----------
 POLYGON ((10 11, 11 11, 11 10.5, 10 10, 10 11))
```

```
(1 row)
```

```
SELECT
inza..ST_AsText(inza..ST_Intersection(inza..ST_WKTToSQL('
POLYGON ((0 0, 0 5, 5 5, 5 0, 0 0))'),
inza..ST_WKTToSQL('POLYGON ((10 10, 10 20, 20 20, 20 15,
10 10))')));
ST_ASTEXT
-----------
 GEOMETRYCOLLECTION EMPTY
(1 row)
```

```
SELECT
inza..ST_AsText(inza..ST_Intersection(inza..ST_WKTToSQL('
POLYGON ((0 0, 0 15, 15 15, 15 0, 0 0))'),
inza..ST_WKTToSQL('POLYGON ((10 10, 10 20, 20 20, 20 15,
10 10))')));
ST_ASTEXT
-----------
 POLYGON ((10 15, 15 15, 15 12.5, 10 10, 10 15))
(1 row)
```

Related Functions

- category Spatial
- ST_Intersects
- ST_SymDifference

ST_Intersects - Checks if Geometries Intersect

Determines whether two geometries intersect.

Usage

The ST_Intersects function has the following syntax:

- **ST_Intersects(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

Type: VARCHAR(ANY)

- **ST_Geometry2**
  A geometry object.

  Type: VARCHAR(ANY)

- Returns
  BOOL Returns TRUE if the two geometries intersect; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is not FF*FF****. The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Intersects(inza..ST_WKTToSQL('POLYGON ((0 0, 11
0, 11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON ((10 10, 10
20, 20 20, 20 15, 10 10))'));

ST_INTERSECTS

---------------

 t

(1 row)


SELECT inza..ST_Intersects(inza..ST_WKTToSQL('POLYGON ((0 0, 0
5, 5 5, 5 0, 0 0))'), inza..ST_WKTToSQL('POLYGON ((10 10, 10 20,
20 20, 20 15, 10 10))'));

ST_INTERSECTS

---------------

 f

(1 row)


SELECT inza..ST_Intersects(inza..ST_WKTToSQL('POLYGON ((0 0, 0
4, 4 0, 0 0))'), inza..ST_WKTToSQL('POLYGON ((0 5, 5 5, 5 0, 0
5))'));

ST_INTERSECTS

---------------

 f

(1 row)
```

Related Functions

- category Spatial
- ST_MBRIntersects
- ST_Intersection

ST_Intersects - Create a geometry that is the union of a table of geometries.

Creates a geometry by doing a union on a table of geometries

Usage

The ST_Intersects aggregate has the following syntax:

- **ST_Intersects(VARCHAR(ANY) geometry);**
  - Parameters
    - **geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the table of geometries intersect; otherwise FALSE.

Examples

```
CREATE TABLE points (PointID integer, the_geom
VARCHAR(200));

INSERT INTO points VALUES (1, inza..ST_WKTToSQL('Point (0
0)'));

INSERT INTO points VALUES (2, inza..ST_WKTToSQL('Point
(22 0)'));

INSERT INTO points VALUES (3, inza..ST_WKTToSQL('Point
(33 33)'));

INSERT INTO points VALUES (4, inza..ST_WKTToSQL('Point
(44 44)'));

SELECT inza..ST_Intersects(the_geom) from (SELECT
the_geom from points order by PointID LIMIT 9999999)
points;

DROP TABLE points;

ST_INTERSECTS

---------------
```

```
 f
(1 row)
```

Related Functions

- category Spatial

ST_Is3D - Checks if Geometry has Z Coordinate

Determines if the geometry has x, y, and z values.

Usage

The ST_Is3D function has the following syntax:

- **ST_Is3D(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the geometry has x, y, and z values; otherwise FALSE.

Examples

```
SELECT inza..ST_Is3D(inza..ST_WKTToSQL('LINESTRING (0 0, 11 0,
11 11, 0 0))'));
 ST_IS3D
---------
 f
(1 row)


SELECT inza..ST_Is3D(inza..ST_WKTToSQL('LINESTRING (0 0 0, 11 0
5, 11 11 9, 0 0 0))'));
 ST_IS3D
---------
 t
(1 row)


SELECT inza..ST_Is3D(inza..ST_POINT(0.0, 1.0, 2.0, 3.0));
```

```
 ST_IS3D
---------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_IsMeasured

ST_IsClosed - Checks if the Line is Closed

Determines if a line is closed.

Usage

The ST_IsClosed function has the following syntax:

- **ST_IsClosed(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a line.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the line is closed; otherwise FALSE.

Details

A line is closed if the start and end points are equal.

Examples

```
SELECT inza..ST_IsClosed(inza..ST_WKTToSQL('LINESTRING (0
0, 11 0, 11 11, 0 0)'));
 ST_ISCLOSED
-------------
 t
(1 row)
```

```
SELECT inza..ST_IsClosed(inza..ST_WKTToSQL('LINESTRING (1
2 3 4, 8 8 8 8, 9 9 9 9, 1 2 3 4)'));
```

```
 ST_ISCLOSED
-------------
 t
(1 row)
```

```
SELECT inza..ST_IsClosed(inza..ST_WKTToSQL('LINESTRING (0 0, 11
0, 11 11)'));
 ST_ISCLOSED
-------------
 f
(1 row)
```

Related Functions

- category Spatial

ST_IsEmpty - Checks if the Geometry is Empty

Determines whether a geometry is empty, that is, has no points.

Usage

The ST_IsEmpty function has the following syntax:

- **ST_IsEmpty(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the geometry is empty; otherwise FALSE.

Examples

```
SELECT inza..ST_IsEmpty(inza..ST_WKTToSQL('POLYGON ((0 0, 11 0,
11 11, 0 11, 0 0))'));
 ST_ISEMPTY
------------
 f
(1 row)
```

```
SELECT inza..ST_IsEmpty(inza..ST_WKTToSQL('POLYGON
EMPTY'));
 ST_ISEMPTY
------------
 t
(1 row)

SELECT inza..ST_IsEmpty(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
 ST_ISEMPTY
------------
 t
(1 row)
```

Related Functions

- category Spatial

ST_IsMeasured - Checks if the Geometry has an M Coordinate

Determines whether the geometry has an m value.

Usage

The ST_IsMeasured function has the following syntax:

- **ST_IsMeasured(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the geometry has an m value; otherwise FALSE.

Examples

```
SELECT inza..ST_IsMeasured(inza..ST_WKTToSQL('LINESTRING
(0 0, 11 0, 11 11, 0 0)'));
```

```
 ST_ISMEASURED
---------------
 f
(1 row)
```

```
SELECT inza..ST_IsMeasured(inza..ST_WKTToSQL('LINESTRING (0 0 0
0, 11 0 5 5, 11 11 9 8, 0 0 0 0)'));
 ST_ISMEASURED
---------------
 t
(1 row)
```

```
SELECT inza..ST_IsMeasured(inza..ST_Point(1.0, 5.0, 8.0,
False));
 ST_ISMEASURED
---------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Is3D

ST_IsRing - Checks if the Line is a Ring

Determines whether a line is a ring.

Usage

The ST_IsRing function has the following syntax:

- **ST_IsRing(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a line.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the line is a ring; otherwise FALSE.

Details

A line is a ring if it is closed and simple.

Examples

```
SELECT inza..ST_IsRing(inza..ST_WKTToSQL('LINESTRING (0
0, 11 0, 11 11, 0 0)'));
 ST_ISRING
-----------
 t
(1 row)

SELECT inza..ST_IsRing(inza..ST_WKTToSQL('LINESTRING (1
2, 3 4, 5 6)'));
 ST_ISRING
-----------
 f
(1 row)
```

Related Functions

- category Spatial

ST_IsSimple - Checks if the Geometry is Simple

Determines is a geometry is simple.

Usage

The ST_IsSimple function has the following syntax:

- **ST_IsSimple(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the geometry is simple; otherwise FALSE.

Details

One example of not being simple is a geometry that intersects with itself.

Examples

```
SELECT inza..ST_IsSimple(inza..ST_WKTToSQL('POINT (1 1)'));
 ST_ISSIMPLE
-------------
 t
(1 row)
```

Related Functions

- category Spatial

ST_Length - Length of the Line

Determines the length of the linestring or multilinestring geometry.

Usage

The ST_Length function has the following syntax:

- **ST_Length(VARCHAR(ANY) Geometry); DOUBLE = ST_Length(VARCHAR(ANY) Geometry, VARCHAR(ANY) unit); DOUBLE = ST_Length(VARCHAR(ANY) Geometry, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_GEOMETRY**
      A geometry object, which must be a LineString or MultiLineString.

      Type: VARCHAR(ANY)
    - **unit**
      The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

      Type: VARCHAR(ANY)

      Default: 'meter'
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: From geometry's SRID or 'WGS84' if geometry has no SRID.
  - Returns
    DOUBLE The length of the line.

Details

Function takes WKB (Well Known Binary) as an input. Geometric objects must be specified in terms of latitude/longitude on a spherical earth model.

Examples

```
SELECT inza..ST_Length(inza..ST_WKTToSQL('LINESTRING(0 0,
3 4, -1 1)'), 'meter', 'cartesian');

ST_LENGTH
-----------
         10
(1 row)


SELECT
inza..ST_Length(inza..ST_WKTToSQL('MULTILINESTRING((0 0,
3 4, -1 1), (100 100, 400 500, 800 800))'), 'meter',
'cartesian');

ST_LENGTH
-----------
       1010
(1 row)


SELECT
inza..ST_Length(inza..ST_WKTToSQL('MULTILINESTRING((0 0,
1 0), (0 1, 1 0))', 4326));

ST_LENGTH
-----------
 268219.05906783
(1 row)
```

Related Functions

- category Spatial

ST_LineFromMultiPoint - Make a Linstring from a Multipoint geometry

Makes a Linstring from a Multipoint geometry

Usage

The ST_LineFromMultiPoint function has the following syntax:

- **ST_LineFromMultiPoint(VARCHAR(ANY) ST_Geometry);**
  - Parameters
    - **ST_Geometry**
      A Multipoint geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) A Linestring geometry object.

Details

ST_LineFromMultiPoint takes a Multipoint geometry object and returns a Linestring geometry object that connects all of the points.

Examples

```
SELECT
inza..ST_AsText(inza..ST_LineFromMultiPoint(inza..ST_WKTToSQL('M
ULTIPOINT (1 1, 1 2, 2 2, 2 1, 1 1)', 4326, false, true)));

                  ST_ASTEXT

-------------------------------------------

 LINESTRING (1 1, 1 2, 2 2, 2 1, 1 1)

(1 row)


SELECT
inza..ST_AsText(inza..ST_LineFromMultiPoint(inza..ST_WKTToSQL('M
ULTIPOINT (0 0, 1 1, 2 2)')));

ST_ASTEXT

-----------

 LINESTRING (0 0, 1 1, 2 2)

(1 row)
```

Related Functions

- category Spatial

ST_LocateAlong - Locate Along

Specifies a derived geometry collection value that matches the specified value of the m coordinate.

Usage

The ST_LocateAlong function has the following syntax:

- **ST_LocateAlong(VARCHAR(ANY) Geometry, DOUBLE m);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **m**
      The start range of the measure to find.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) Returns a derived geometry collection value that matches the specified value of m coordinate; returns an empty GeometryCollection for geometries without m values.

Details

Points, MultiPoints, LineStrings and MultiLineStrings are supported. This function operates only for cartesian coordinates.

Examples

```
SELECT
inza..ST_AsText(inza..ST_LocateAlong(inza..ST_WKTToSQL('M
ULTIPOINT (0 0 0 4, 100 0 0 5, 100 100 5 6, 0 100 7 8, 1
0 9 5)'), 5));

ST_ASTEXT

-----------

 MULTIPOINT ZM (100 0 0 5, 1 0 9 5)

(1 row)
```

Related Functions

- category Spatial
- ST_LocateBetween

ST_LocateBetween - Locate Between

Determines a derived geometry collection value that matches the specified range of m coordinate values inclusively. Points, MultiPoints, LineStrings and MultiLineStrings are supported. This func-

tion operates only for cartesian coordinates.

Usage

The ST_LocateBetween function has the following syntax:

- **ST_LocateBetween(VARCHAR(ANY) Geometry, DOUBLE m1, DOUBLE m2);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **m1**
      The start range of the measure to find.

      Type: VARCHAR(ANY)
    - **m2**
      The end range of the measure to find.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) Returns a derived geometry collection value that matches the specified range of m coordinate values inclusively; returns an empty GeometryCollection for geometries without m values.

Examples

```
SELECT
inza..ST_AsText(inza..ST_LocateBetween(inza..ST_WKTToSQL('MULTIP
OINT (0 0 0 4, 100 0 0 5, 100 100 5 6, 0 100 7 8, 1 0 9 5)'), 5,
8));

ST_ASTEXT

-----------

 MULTIPOINT ZM (100 0 0 5, 100 100 5 6, 0 100 7 8, 1 0 9 5)

(1 row)
```

Related Functions

- category Spatial
- ST_LocateAlong

ST_M - M Coordinate of a Point

Determines the m coordinate of a point object or sets the M coordinate of a point object to the specified M value.

Usage

The ST_M function has the following syntax:

- **ST_M(VARCHAR(ANY) Geometry); VARCHAR(100) = ST_M(VARCHAR(ANY) Geometry, DOUBLE M);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a point object.

      Type: VARCHAR(ANY)
    - **m**
      (Optional) The value to set for m. If NULL, the m value is removed from the point.

      Type: DOUBLE
  - Returns
    DOUBLE_Or_VARCHAR(100) The m coordinate or a geometry object with the m coordinate set to the value specified by m.

Examples

```
SELECT inza..ST_M(inza..ST_Point(0.0, 1.0, 2.0, 3.0));
 ST_M
------
    3
(1 row)


SELECT inza..ST_M(inza..ST_Point(0.0, 1.0, 2.0, false));
ST_M
------
    2
(1 row)


SELECT
inza..ST_AsText(inza..ST_M(inza..ST_WKTTOSQL('POINT (0.0
1.0)'), 5.0));
ST_ASTEXT
-----------
 POINT M (0 1 5)
```

```
(1 row)
```

Related Functions

- category Spatial
- ST_X
- ST_Y
- ST_Z
- ST_Point

ST_MaxM - Maximum M Coordinate of a Geometry

Determines the maximum m coordinate of a geometry object.

Usage

The ST_MaxM function has the following syntax:

- **ST_MaxM(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE The maximum m coordinate; NULL if geometry is empty.

Examples

```
SELECT inza..ST_MaxM(inza..ST_WKTToSQL('POLYGON ((10 10 0 50, 10
20 1 60, 20 20 2 70, 20 15 3 80, 10 10 0 50))'));
 ST_MAXM
---------
      80
(1 row)


SELECT inza..ST_MaxM(inza..ST_WKTToSQL('LINESTRING EMPTY'));
ST_MAXM
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MaxZ
- ST_MinX
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_MaxX - Maximum X Coordinate of a Geometry

Determines the maximum x coordinate of a geometry object.

Usage

The ST_MaxX function has the following syntax:

- **ST_MaxX(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE Maximum x coordinate; NULL if the geometry is empty.

Examples

```
SELECT inza..ST_MaxX(inza..ST_WKTToSQL('POLYGON ((10 10,
10 20, 20 20, 20 15, 10 10))'));

 ST_MAXX
---------
      20
(1 row)


SELECT
inza..ST_MaxX(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 10),POINT (30 30), LINESTRING (15 15, 20 20))'));

 ST_MAXX
---------
```

```
      30
(1 row)
```

```
SELECT inza..ST_MaxX(inza..ST_WKTToSQL('LINESTRING EMPTY'));
 ST_MAXX
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxY
- ST_MaxZ
- ST_MaxM
- ST_MinX
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_MaxY - Maximum Y Coordinate of a Geometry

Determines the maximum y coordinate of a geometry object.

Usage

The ST_MaxY function has the following syntax:

- **ST_MaxY(VARCHAR(ANY));**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE The maximum y coordinate; NULL if the geometry is empty.

Examples

```
SELECT inza..ST_MaxY(inza..ST_WKTToSQL('POLYGON ((10 10, 10 30,
20 20, 20 15, 10 10))'));
 ST_MAXY
---------
```

```
      30
(1 row)
```

```
SELECT
inza..ST_MaxY(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 10),POINT (30 15), LINESTRING (15 15, 20 20))'));
ST_MAXY
---------
      20
(1 row)
```

```
SELECT inza..ST_MaxY(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
 ST_MAXY
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxZ
- ST_MaxM
- ST_MinX
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_MaxZ - Maximum Z Coordinate of a Geometry

Determines the maximum z coordinate of a geometry object.

Usage

The ST_MaxZ function has the following syntax:

- **ST_MaxZ(VARCHAR(ANY) Geometry);**
  - Parameters

- **ST_Geometry**
  A geometry object.

  Type: VARCHAR(ANY)

- Returns
  DOUBLE The maximum z coordinate; NULL if the geometry is empty

Examples

```
SELECT inza..ST_MaxZ(inza..ST_WKTToSQL('POLYGON ((10 10 0, 10 20
1, 20 20 2, 20 15 3, 10 10 0))'));

ST_MAXZ

---------

       3

(1 row)


SELECT inza..ST_MaxZ(inza..ST_WKTToSQL('POLYGON ((10 10 10 10,
10 20 20 20, 20 20 20 20, 20 15 15 40, 10 10 10 10))'));

 ST_MAXZ

---------

      20

(1 row)


SELECT inza..ST_MaxZ(inza..ST_WKTToSQL('LINESTRING EMPTY'));

ST_MAXZ

---------

(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MaxM
- ST_MinX
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_MBR - Bounding Box of a Geometry

Determines the bounding box of a geometry object.

Usage

The ST_MBR function has the following syntax:

- **ST_MBR(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(200) The bounding box as a geometry object.

Details

This function always returns a rectangle as a polygon. ST_MBR is exactly the same as ST_Envelope.

Examples

```
SELECT
inza..ST_AsText(inza..ST_MBR(inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));
ST_ASTEXT
-----------
 POLYGON ((10 10, 10 20, 20 20, 20 10, 10 10))
(1 row)


SELECT
inza..ST_AsText(inza..ST_MBR(inza..ST_WKTToSQL('POINT (0
1)')));
ST_ASTEXT
-----------
 POLYGON ((0 1, 0 1, 0 1, 0 1, 0 1))
(1 row)
```

Related Functions

- category Spatial

- ST_Point
- ST_Envelope

ST_MBRIntersects - Checks if MBRs of the Geometries Intersect

Determines whether the minimum bounding rectangles of the two geometries intersect.

Usage

The ST_MBRIntersects function has the following syntax:

- **ST_MBRIntersects(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the minimum bounding rectangles of the two geometries intersect; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the minimum bounding rectangles of the two geometries is not FF*FF****.

Examples

```
SELECT inza..ST_MBRIntersects(inza..ST_WKTToSQL('POLYGON ((0 0,
11 0, 11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON ((10 10,
10 20, 20 20, 20 15, 10 10))'));

 ST_MBRINTERSECTS
------------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Intersects

ST_MinM - Minimum M Coordinate of a Geometry

Determines the minimum m coordinate of a geometry object.

Usage

The ST_MinM function has the following syntax:

- **ST_MinM(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE The minimum m coordinate; NULL if the geometry is empty

Examples

```
SELECT inza..ST_MinM(inza..ST_WKTToSQL('POLYGON ((10 10 0
50, 10 20 1 60, 20 20 2 70, 20 15 3 80, 10 10 0 50))'));
 ST_MINM
---------
      50
(1 row)


SELECT
inza..ST_MinM(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 10 10 10),POINT (30 30 30 30), LINESTRING (15 15 15
15, 20 20 20 20))'));
ST_MINM
---------
      10
(1 row)


SELECT inza..ST_MinM(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
 ST_MINM
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MaxZ
- ST_MaxM
- ST_MinY
- ST_MinM
- ST_MinM
- ST_Envelope

ST_MinX - Minimum X Coordinate of a Geometry

Determines the minimum x coordinate of a geometry object.

Usage

The ST_MinX function has the following syntax:

- **ST_MinX(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE Returns the minimum x coordinate of a geometry object.

Examples

```
SELECT inza..ST_MinX(inza..ST_WKTToSQL('POLYGON ((10 10, 10 20,
20 20, 20 15, 10 10))'));
 ST_MINX
---------
      10
(1 row)


SELECT inza..ST_MinX(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 5),POINT (30 15), LINESTRING (15 15, 20 20))'));
 ST_MINX
---------
      10
(1 row)
```

```
SELECT inza..ST_MinX(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
 ST_MINX
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MaxZ
- ST_MaxM
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_MinY - Minimum Y Coordinate of a Geometry

Determines the minimum y coordinate of a geometry object.

Usage

The ST_MinY function has the following syntax:

- **ST_MinY(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    DOUBLE The minimum y coordinate of the geometry object; NULL if the geometry is empty.

Examples

```
SELECT inza..ST_MinY(inza..ST_WKTToSQL('POLYGON ((10 10,
10 20, 20 20, 20 15, 10 10))'));
ST_MINY
---------
```

```
      10
(1 row)
```

```
SELECT inza..ST_MinY(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 5),POINT (30 15),LINESTRING (15 15, 20 20))'));
ST_MINY
---------
        5
(1 row)
```

```
SELECT inza..ST_MinY(inza..ST_WKTToSQL('LINESTRING EMPTY'));
ST_MINY
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MinX
- ST_MinZ
- ST_MaxZ
- ST_MaxM
- ST_MinM
- ST_Envelope

ST_MinZ - Minimum Z Coordinate of a Geometry

Determines the minimum z coordinate of a geometry object.

Usage

The ST_MinZ function has the following syntax:

- **ST_MinZ(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)

- Returns
  DOUBLE The minimum z coordinate; NULL if the geometry is empty.

Examples

```
SELECT inza..ST_MinZ(inza..ST_WKTToSQL('POLYGON ((10 10
0, 10 20 1, 20 20 2, 20 15 3, 10 10 0))'));
 ST_MINZ
---------
       0
(1 row)


SELECT inza..ST_MinZ(inza..ST_WKTToSQL('POLYGON ((10 10
10 10, 10 20 20 20, 20 20 20 20, 20 15 15 40, 10 10 10
10))'));
 ST_MINZ
---------
      10
(1 row)


SELECT inza..ST_MinZ(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
 ST_MINZ
---------
(1 row)
```

Related Functions

- category Spatial
- ST_MaxX
- ST_MaxY
- ST_MaxZ
- ST_MaxM
- ST_MinY
- ST_MinZ
- ST_MinM
- ST_Envelope

ST_NumGeometries - Number of Geometries in a Collection

Determines the number of geometries in the geometry object.

Usage

The ST_NumGeometries function has the following syntax:

- **ST_NumGeometries(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    INT4 The number of geometries in the geometry object; returns 1 for geometries that are not collections.

Examples

```
SELECT
inza..ST_NumGeometries(inza..ST_WKTToSQL('GEOMETRYCOLLECTION
(POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10)), POINT (5 6))'));
ST_NUMGEOMETRIES
------------------
                 2
(1 row)

SELECT inza..ST_NumGeometries(inza..ST_POINT(1, 5));
ST_NUMGEOMETRIES
------------------
                 1
(1 row)
```

Related Functions

- category Spatial

ST_NumInteriorRing - Number of Interior Rings

Determines the number of interior rings of the polygon.

Usage

The ST_NumInteriorRing function has the following syntax:

- **ST_NumInteriorRing(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a polygon.

      Type: VARCHAR(ANY)
  - Returns
    INT4 Number of interior rings of the polygon.

Examples

```
SELECT
inza..ST_NumInteriorRing(inza..ST_WKTToSQL('POLYGON ((0
0, 100 0, 100 100, 0 100, 0 0), (10 10, 10 20, 20 20, 20
15, 10 10))'));
 ST_NUMINTERIORRING
--------------------
                  1
(1 row)


SELECT
inza..ST_NumInteriorRing(inza..ST_WKTToSQL('POLYGON ((0
0, 100 0, 100 100, 0 100, 0 0))'));
 ST_NUMINTERIORRING
--------------------
                  0
(1 row)


SELECT
inza..ST_NumInteriorRing(inza..ST_WKTToSQL('POLYGON
EMPTY'));
 ST_NUMINTERIORRING
--------------------
                  0
(1 row)
```

Related Functions

- category Spatial

ST_NumPoints - Number of Vertices of the Geometry

Determines the number of vertices of the geometry object.

Usage

The ST_NumPoints function has the following syntax:

- **ST_NumPoints(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    INT4 The number of vertices of the geometry object.

Examples

```
SELECT inza..ST_NumPoints(inza..ST_WKTToSQL('POLYGON ((10 10, 10
20, 20 20, 20 15, 10 10))'));

ST_NUMPOINTS

--------------

             5

(1 row)


SELECT
inza..ST_NumPoints(inza..ST_WKTToSQL('GeometryCollection(POINT
(10 10),POINT (30 30), LINESTRING (15 15, 20 20))'));

ST_NUMPOINTS

--------------

             4

(1 row)


SELECT inza..ST_NumPoints(inza..ST_WKTToSQL('POLYGON ((0 0, 110
0, 110 110, 0 110, 0 0), (10 10, 10 20, 20 20, 20 15, 10
10))'));
```

```
 ST_NUMPOINTS
--------------
            10
(1 row)
```

Related Functions

- category Spatial

ST_Overlaps - Checks if Geometries Overlap

Determines if two geometries overlap.

Usage

The ST_Overlaps function has the following syntax:

- **ST_Overlaps(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL Returns TRUE if the two geometries overlap; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is T*T***T**, or, for two lines, 1*T***T**. Current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Overlaps(inza..ST_WKTToSQL('LINESTRING (0
0, 10 10)'), inza..ST_WKTToSQL('LINESTRING (5 5, 11
11)'));
ST_OVERLAPS
-------------
 t
```

```
(1 row)
```

Related Functions

- category Spatial
- ST_Relate

ST_Perimeter - Perimeter of Geometry

Computes the perimeter of the specified geometry.

Usage

The ST_Perimeter function has the following syntax:

- **ST_Perimeter(VARCHAR(ANY) Geometry); DOUBLE = ST_Perimeter(VARCHAR(ANY) Geometry, VARCHAR(ANY) unit); DOUBLE = ST_Perimeter(VARCHAR(ANY) Geometry, VARCHAR(ANY) unit, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **unit**
      The units. Possible values include "meter", "kilometer", "foot", "mile" and "nautical mile".

      Type: VARCHAR(ANY)

      Default: 'meter'
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: The geometry's SRID or 'WGS84' if geometry has no SRID.
  - Returns
    DOUBLE The perimeter of the geometry object.

Examples

```
SELECT inza..ST_Perimeter(inza..ST_WKTToSQL('POLYGON((0 0, 0 1,
1 1, 1 0, 0 0))', 1234));

ST_PERIMETER

--------------

             4

(1 row)
```

```
SELECT
inza..ST_Perimeter(inza..ST_WKTToSQL('MULTIPOLYGON(((0 0,
0 1, 1 1, 1 0, 0 0)), ((0 0, 0 4, 5 4, 5 0, 0 0)))',
1234));
 ST_PERIMETER
--------------
           22
(1 row)
```

Related Functions

- category Spatial

ST_Point - Point Constructor

Specifies a point geometry object with the specified coordinates.

Usage

The ST_Point function has the following syntax:

- **ST_Point(DOUBLE X, DOUBLE Y); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE Z); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE Z, DOUBLE M); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE ZorM, BOOL isZ); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, INT4 SRID); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE Z, INT4 SRID); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE Z, DOUBLE M, INT4 SRID); VARCHAR(50) = ST_Point(DOUBLE X, DOUBLE Y, DOUBLE ZorM, BOOL isZ, INT4 SRID);**
  - Parameters
    - **x**
      The x coordinate.

      Type: DOUBLE
    - **y**
      The y coordinate.

      Type: DOUBLE
    - **z**
      (Optional) The z coordinate.

      Type: DOUBLE
    - **m**
      (Optional) The m coordinate.

Type: DOUBLE

- **isZ**
  (Optional) TRUE indicates that the third parameter is z; false indicates m.

  Type: BOOL

- **SRID**
  (Optional) The Spatial reference system identifier.

  Type: INT4

- Returns
  VARCHAR(50) A point geometry object.

Examples

```
SELECT inza..ST_AsText(inza..ST_Point(1.0, 5.0));
ST_ASTEXT
-----------
 POINT (1 5)
(1 row)


SELECT inza..ST_AsText(inza..ST_Point(1.0, 5.0, 6.0));
ST_ASTEXT
-----------
 POINT Z (1 5 6)
(1 row)


SELECT inza..ST_AsText(inza..ST_Point(1.0, 5.0, 8.0, False,
4326));
ST_ASTEXT
-----------
 POINT M (1 5 8)
(1 row)
```

Related Functions

- category Spatial

ST_PointN - Nth Point in Linestring

Determines the Nth point from the linestring.

Usage

The ST_PointN function has the following syntax:

- **ST_PointN(VARCHAR(ANY), INT4);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **n**
      A 1-based index.

      Type: INT4
  - Returns
    VARCHAR(100) A point object.

Examples

```
SELECT
inza..ST_AsText(inza..ST_POINTN(inza..ST_WKTToSQL('LINEST
RING (0 0, 1 1, 2 2, 10 10)'), 2));

ST_ASTEXT
-----------
 POINT (1 1)
(1 row)
```

Related Functions

- category Spatial

ST_PointOnSurface - Point on the Surface

Finds a point that is guaranteed to be in the interior of the surface or multisurface.

Usage

The ST_PointOnSurface function has the following syntax:

- **ST_PointOnSurface(VARCHAR(ANY) Geometry)**
  - Parameters
    - **ST_Geometry**
      A geometry object.

Type: VARCHAR(ANY)

- Returns
  VARCHAR(100) A point in the interior of the specified surface or multisurface.

Examples

```
SELECT
inza..ST_ASTEXT(inza..ST_POINTONSURFACE(inza..ST_WKTToSQL('POLYG
ON ((30 110, 50 110, 50 130, 30 130, 30 110))')));
```

```
ST_ASTEXT
-----------
 POINT (40 120)
(1 row)
```

Related Functions

- category Spatial

ST_Relate - Relation of Geometries

Determines whether the intersection matrix of two geometries equals the specified intersection matrix.

Usage

The ST_Relate function has the following syntax:

- **ST_Relate(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2, CHAR(9) intersectionMatrix);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
    - **intersectionMatrix**
      Dimensionally Extended 9 Intersection Model (DE-9IM).

      Type: CHAR(9)
  - Returns
    BOOL Returns TRUE if the intersection matrix of two geometries equals the specified intersection matrix; otherwise FALSE.

Examples

```
SELECT inza..ST_RELATE(inza..ST_WKTToSQL('LINESTRING (0
0, 10 10)'), inza..ST_WKTToSQL('LINESTRING (5 5, 11
11)'), '1*T***T**');
 ST_RELATE
-----------
 t
(1 row)


SELECT inza..ST_RELATE(inza..ST_WKTToSQL('POLYGON ((40
120, 90 120, 90 150, 40 150, 40 120))'),
inza..ST_WKTToSQL('POLYGON ((30 110, 50 110, 50 130, 30
130, 30 110))'), 'T*T***FF*');
 ST_RELATE
-----------
 f
(1 row)
```

Related Functions

- category Spatial
- ST_Contains
- ST_Crosses
- ST_Disjoint
- ST_Equals
- ST_Relate
- ST_Touches
- ST_Within

ST_SRID - Setter/Getter of the SRID

Sets or gets the SRID from a geometry object.

Usage

The ST_SRID function has the following syntax:

- **ST_SRID(VARCHAR(ANY) Geometry); VARCHAR(30) = ST_SRID(VARCHAR(ANY) Geometry, INT4 SRID);**
  - Parameters

- **ST_Geometry**
  A geometry object.

  Type: VARCHAR(ANY)

- **SRID**
  (Optional) If specified, sets the Spatial Reference System Identifier.

  Type: INT4

- Returns
  INT4_Or_VARCHAR(200) The SRID for the get. A geometry with the SRID for the set.

Examples

```
SELECT inza..ST_SRID(inza..ST_Point(1.0, 5.0, 4326));
 ST_SRID
---------
    4326
(1 row)


SELECT inza..ST_SRID(inza..ST_WKTToSQL('POLYGON((10 10, 10 20,
20 20, 20 15, 10 10))'));
ST_SRID
---------
    4326
(1 row)


SELECT
inza..ST_SRID(inza..ST_SRID(inza..ST_WKTToSQL('POLYGON((10 10,
10 20, 20 20, 20 15, 10 10))'), 1234));
ST_SRID
---------
    1234
(1 row)
```

Related Functions

- category Spatial

ST_StartPoint - First Point of a Line

Determines the first point of a line.

Usage

The ST_StartPoint function has the following syntax:

- **ST_StartPoint(VARCHAR(ANY) Geometry);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a line.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(50) Returns a point geometry object representing the first point of the line; NULL if there is no start point.

Examples

```
SELECT
inza..ST_AsText(inza..ST_StartPoint(inza..ST_WKTToSQL('LI
NESTRING (0 0, 11 0, 11 11))')));
ST_ASTEXT
-----------
 POINT (0 0)
(1 row)

SELECT
inza..ST_AsText(inza..ST_StartPoint(inza..ST_WKTToSQL('LI
NESTRING (0 0 1, 11 0 5, 11 11 7))')));
ST_ASTEXT
-----------
 POINT Z (0 0 1)
(1 row)

SELECT inza..ST_StartPoint(inza..ST_WKTToSQL('LINESTRING
EMPTY'));
ST_STARTPOINT
---------------
(1 row)
```

Related Functions

- category Spatial

ST_SymDifference - Symmetric Difference of Geometries

Determines a geometry object representing the non-intersecting parts of the specified geometries.

Usage

The ST_SymDifference function has the following syntax:

- **ST_SymDifference(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) A geometry object representing the non-intersecting parts of the specified geometries.

Examples

```
SELECT
inza..ST_ASTEXT(inza..ST_SYMDIFFERENCE(inza..ST_WKTToSQL('POLYGO
N ((0 0, 11 0, 11 11, 0 11, 0 0))'), inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));

ST_ASTEXT

-----------

 MULTIPOLYGON (((11 10.5, 11 0, 0 0, 0 11, 10 11, 10 10, 11
10.5)), ((11 10.5, 11 11, 10 11, 10 20, 20 20, 20 15, 11
10.5)))

(1 row)
```

Related Functions

- category Spatial
- ST_Intersection

ST_Touches - Checks if Geometries Touch

Determines whether the two geometries touch, but their interiors do not intersect.

Usage

The ST_Touches function has the following syntax:

- **ST_Touches(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    BOOL TRUE if the two geometries touch, but their interiors do not intersect; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is FT*******, F**T***** or F***T****. The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Touches(inza..ST_WKTToSQL('LINESTRING (0
0, 10 10)'), inza..ST_WKTToSQL('LINESTRING (5 5, 11
11)'));
 ST_TOUCHES
------------
 f
(1 row)


SELECT inza..ST_Touches(inza..ST_WKTToSQL('LINESTRING (0
0, 10 10)'), inza..ST_WKTToSQL('LINESTRING (10 10, 11
11)'));
 ST_TOUCHES
------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Relate

ST_Union - Create a geometry that is the union of a table of geometries.

Creates a geometry by doing a union on a table of geometries

Usage

The ST_Union aggregate has the following syntax:

- **ST_Union(VARCHAR(ANY) geometry);**
  - Parameters
    - **geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The unified geometry object.

Examples

```
CREATE TABLE points (PointID integer, the_geom VARCHAR(200));

INSERT INTO points VALUES (1, inza..ST_WKTToSQL('Point (0 0)'));

INSERT INTO points VALUES (2, inza..ST_WKTToSQL('Point (22
0)'));

INSERT INTO points VALUES (3, inza..ST_WKTToSQL('Point (33
33)'));

INSERT INTO points VALUES (4, inza..ST_WKTToSQL('Point (44
44)'));

SELECT inza..ST_AsText(inza..ST_Union(the_geom)) from (SELECT
the_geom from points order by PointID LIMIT 9999999) points;

DROP TABLE points;

                ST_ASTEXT

----------------------------------------

 MULTIPOINT (44 44, 33 33, 22 0, 0 0)

(1 row)
```

Related Functions

- category Spatial

ST_Union - Union of Geometries

Finds a geometry object representing the union of the specified geometries.

Usage

The ST_Union function has the following syntax:

- **ST_Union(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) A geometry object representing the union of the specified geometries.

Examples

```
SELECT
inza..ST_AsText(inza..ST_Union(inza..ST_WKTToSQL('POLYGON
((0 0, 5 0, 5 5, 0 5, 0 0))'), inza..ST_WKTToSQL('POLYGON
((10 10, 10 20, 20 20, 20 15, 10 10))')));

ST_ASTEXT

-----------

 MULTIPOLYGON (((0 0, 5 0, 5 5, 0 5, 0 0)), ((10 10, 10
20, 20 20, 20 15, 10 10)))

(1 row)
```

Related Functions

- category Spatial

ST_Version - IBM Netezza Spatial Version

Returns the version of the IBM Netezza Spatial Package.

Usage

The ST_Version function has the following syntax:

- **ST_Version();**
  - Returns
    VARCHAR(20) The version of IBM Netezza Spatial Package.

Related Functions

- category Spatial

ST_Within - Checks if the Geometry is Within Another Geometry

Determines if the first specified geometry is completely within the second geometry.

Usage

The ST_Within function has the following syntax:

- **ST_Within(VARCHAR(ANY) Geometry1, VARCHAR(ANY) Geometry2, VARCHAR(ANY) cSystem);**
  - Parameters
    - **ST_Geometry1**
      A geometry object.

      Type: VARCHAR(ANY)
    - **ST_Geometry2**
      A geometry object.

      Type: VARCHAR(ANY)
    - **cSystem**
      The coordinate system.

      Type: VARCHAR(ANY)

      Default: From geometry's SRID or 'WGS84' if geometry has no SRID.
  - Returns
    BOOL Returns TRUE if the first geometry is completely within the second geometry; otherwise FALSE.

Details

Returns TRUE if the DE-9IM intersection matrix for the two geometries is T*F**F***. ST_Within is the reverse of ST_Contains. The current implementation performs calculations treating all coordinate systems as cartesian.

Examples

```
SELECT inza..ST_Within(inza..ST_WKTToSQL('POLYGON ((10 10, 10
20, 20 20, 20 15, 10 10))', 1234), inza..ST_WKTToSQL('POLYGON
((0 0, 110 0, 110 110, 0 110, 0 0))', 1234));
```

```
ST_WITHIN
------------
 t
(1 row)
```

Related Functions

- category Spatial
- ST_Contains
- ST_Relate

ST_WKBToSQL - Geometry from WKB Representation

Determines a geometry object from the Well-Known Binary (WKB) representation.

Usage

The ST_WKBToSQL function has the following syntax:

- **ST_WKBToSQL(VARCHAR(ANY) WKB); VARCHAR(ANY) = ST_WKBToSQL(VARCHAR(ANY) WKB, INT4 Srid); VARCHAR(ANY) = ST_WKBToSQL(VARCHAR(ANY) WKB, INT4 Srid, BOOL ComputeMBR); VARCHAR(ANY) = ST_WKBToSQL(VARCHAR(ANY) WKB, INT4 Srid, BOOL ComputeMBR, BOOL SkipSimpleTest);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **SRID**
      The Spatial Reference System Identifier.

      Type: INT4

      Default: 4326
    - **computeMBRFlag**
      A Boolean value indicating whether the MBR should be computed.

      Type: BOOL

      Default: TRUE
    - **skipSimpleTest**
      (Optional) A Boolean value indicating whether the simple geometry test should be skipped.

      Type: BOOL

Default: FALSE

- Returns
  VARCHAR(ANY) A geometry object.

Details

ST_WKBToSQL is exactly the same as ST_GeomFromWKB. ST_WKBToSQL is the reverse of ST_AsBinary.

Examples

```
select
inza..ST_AsText(inza..ST_WKBToSQL(inza..ST_AsBinary(inza..ST_WKT
ToSQL('POLYGON ((0 0, 11 0, 11 11, 0 11, 0 0))'))));

ST_ASTEXT
-------------------------------------------------------------------
-------------------------------------------------------------------
-------------------------------------------------------------------
----------------------
 POLYGON ((0 0, 11 0, 11 11, 0 11, 0 0))
(1 row)

select
inza..ST_AsText(inza..ST_WKBToSQL(inza..ST_AsBinary(inza..ST_WKT
ToSQL('LINESTRING(0 0, 3 4, -1 1)'))));

                                                                ST
_ASTEXT
-------------------------------------------------------------------
-------------------------------------------------------------------
-----
 LINESTRING (0 0, 3 4, -1 1)
(1 row)



select
inza..ST_AsText(inza..ST_WKBToSQL(inza..ST_AsBinary(inza..ST_Poi
nt(1, 5))));
ST_ASTEXT
-----------
 POINT (1 5)
(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKTToSQL
- ST_AsText
- ST_AsBinary

ST_WKBToWKT - WKT Representation from WKB Format

Returns the Well-Known Text (WKT) representation of a geometry object.

Usage

The ST_WKBToWKT function has the following syntax:

- **ST_WKBToWKT(VARCHAR(ANY) WKB);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) The Well-Known Text (WKT) representation of a geometry object.

Details

Does not return the SRID. ST_WKBToWKT is the reverse of ST_GeomFromText.

Examples

```
SELECT inza..ST_WKBToWKT(inza..ST_WKTToWKB('POLYGON((0 0,
1 2, 3 -1, 0 0))'));

ST_WKBTOWKT

-------------

 POLYGON ((0 0, 1 2, 3 -1, 0 0))

(1 row)


SELECT inza..ST_WKBToWKT(inza..ST_WKTToWKB('POLYGON((0 0,
0 2, 1 4, 2 2, 2 0, 0 0))'));

ST_WKBTOWKT
```

```
-------------
 POLYGON ((0 0, 0 2, 1 4, 2 2, 2 0, 0 0))
(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKTToSQL
- ST_WKBToSQL
- ST_AsBinary

ST_WKTToSQL - Geometry from WKT Representation

Determines a geometry object from the Well-Known Text (WKT) representation.

Usage

The ST_WKTToSQL function has the following syntax:

- **ST_WKTToSQL(VARCHAR(ANY) WKTString); VARCHAR(ANY) = ST_WKTToSQL(VARCHAR(ANY) WKTString,INT4 Srid); VARCHAR(ANY) = ST_WKTToSQL(VARCHAR(ANY) WKTString,INT4 Srid, BOOL ComputeMBR); VARCHAR(ANY) = ST_WKTToSQL(VARCHAR(ANY) WKTString,INT4 Srid, BOOL ComputeMBR, BOOL SkipSimpleTest);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
    - **SRID**
      The Spatial Reference System Identifier.

      Type: INT4

      Default: 4326
    - **computeMBRFlag**
      (Optional) A Boolean value indicating whether the MBR should be computed.

      Type: BOOL

      Default: TRUE
    - **skipSimpleTest**
      (Optional) A Boolean value indicating whether the simple geometry test should be skipped.

      Type: BOOL

      Default: FALSE
  - Returns

VARCHAR(ANY) A geometry object.

Details

ST_WKTToSQL is exactly the same as ST_GeomFromWKT. ST_WKTToSQL is the reverse of ST_AsText.

Examples

```
SELECT inza..ST_AsText(inza..ST_WKTToSQL('POLYGON ((10
10, 10 20, 20 20, 20 15, 10 10))'));

ST_ASTEXT
-----------------------------------------------------------
-----------------------------------------------------------
-----------------------------------------------------------
-------------------------------------------

 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)

SELECT inza..ST_AsText(inza..ST_WKTToSQL('POLYGON ((10
10, 10 20, 20 20, 20 15, 10 10))', 4326));

ST_ASTEXT
-----------------------------------------------------------
-----------------------------------------------------------
-----------------------------------------------------------
-------------------------------------------

 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)

SELECT inza..ST_AsText(inza..ST_WKTToSQL('POLYGON ((10
10, 10 20, 20 20, 20 15, 10 10))', 4326, true));

ST_ASTEXT
-----------

 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))
(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKBToSQL
- ST_AsText
- ST_AsBinary

ST_WKTToWKB - WKB Representation from WKT Format

Finds a Well-Known Binary (WKB) geometry object from the Well-Known Text (WKT) representation.

Usage

The ST_WKTToWKB function has the following syntax:

- **ST_WKTToWKB(VARCHAR(ANY) WKTString);**
  - Parameters
    - **ST_Geometry**
      A geometry object.

      Type: VARCHAR(ANY)
  - Returns
    VARCHAR(ANY) A WKB geometry object.

Details

ST_WKTToWKB is exactly the same as ST_GeomFromWKT. ST_WKTToWKB is the reverse of ST_AsText.

Examples

```
SELECT inza..ST_WKBToWKT(inza..ST_WKTToWKB('POLYGON ((10 10, 10
20, 20 20, 20 15, 10 10))'));

                    ST_WKBTOWKT

-----------------------------------------------

 POLYGON ((10 10, 10 20, 20 20, 20 15, 10 10))

(1 row)
```

Related Functions

- category Spatial
- ST_GeomFromText
- ST_GeomFromWKB
- ST_WKBToSQL
- ST_AsText
- ST_AsBinary

ST_X - X Coordinate of a Point

Determines the x coordinate of a point object, or sets the x coordinate of a point object, to the specified value.

Usage

The ST_X function has the following syntax:

- **ST_X(VARCHAR(ANY) Geometry); VARCHAR(100) = ST_X(VARCHAR(ANY) Geometry, DOUBLE X);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a point object.

      Type: VARCHAR(ANY)
    - **x**
      (Optional) Sets the value for the x coordinate.

      Type: DOUBLE
  - Returns
    DOUBLE_Or_VARCHAR(100) The x coordinate, or a geometry object with the x coordinate set to the specified x value.

Examples

```
SELECT inza..ST_X(inza..ST_Point(0.0, 1.0));
 ST_X
------
    0
(1 row)


SELECT inza..ST_AsText(inza..ST_X(inza..ST_Point(0.0,
1.0), 5));
ST_ASTEXT
-----------
 POINT (5 1)
(1 row)


SELECT inza..ST_AsText(inza..ST_X(inza..ST_Point(0.0,
```

```
1.0, 2.0), 5));
ST_ASTEXT
-----------
 POINT Z (5 1 2)
(1 row)

SELECT inza..ST_AsText(inza..ST_X(inza..ST_Point(0.0, 1.0, 2.0,
3.0), 5));
ST_ASTEXT
-----------
 POINT ZM (5 1 2 3)
(1 row)
```

Related Functions

- category Spatial
- ST_Y
- ST_Z
- ST_M
- ST_Point

ST_Y - Y Coordinate of a Point

Determines the y coordinate of a point object, or sets the y coordinate of a point object, to the specified value.

Usage

The ST_Y function has the following syntax:

- **ST_Y(VARCHAR(ANY) Geometry); VARCHAR(100) = ST_Y(VARCHAR(ANY) Geometry, DOUBLE Y);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a point object.

      Type: VARCHAR(ANY)
    - **y**
      (Optional) Sets the value for the y coordinate.

      Type: DOUBLE
  - Returns
    DOUBLE_Or_VARCHAR(100) The y coordinate, or a geometry object with the y coordinate set to the value specified by y.

Examples

```
SELECT inza..ST_Y(inza..ST_Point(0.0, 1.0));
ST_Y
------
    1
(1 row)

SELECT inza..ST_AsText(inza..ST_Y(inza..ST_Point(0.0,
1.0), 5));
ST_ASTEXT
-----------
 POINT (0 5)
(1 row)

SELECT inza..ST_AsText(inza..ST_Y(inza..ST_Point(0.0,
1.0, 2.0, 3.0), 5));
ST_ASTEXT
-----------
 POINT ZM (0 5 2 3)
(1 row)
```

Related Functions

- category Spatial
- ST_Y
- ST_Z
- ST_M
- ST_Point

ST_Z - Z Coordinate of a Point

Determines the z coordinate of a point object or sets the z coordinate of a point object to the specified value.

Usage

The ST_Z function has the following syntax:

- **ST_Z(VARCHAR(ANY) Geometry); VARCHAR(100) = ST_Z(VARCHAR(ANY) Geometry, DOUBLE Z);**
  - Parameters
    - **ST_Geometry**
      A geometry object, which must be a point object.

      Type: VARCHAR(ANY)
    - **z**
      (Optional) Sets the value for the z coordinate. If NULL, the z value is removed from the point.

      Type: DOUBLE
  - Returns
    DOUBLE_Or_VARCHAR(100) The z coordinate or the geometry object with the z coordinate set to the specified z value.

Examples

```
SELECT inza..ST_Z(inza..ST_Point(0.0, 1.0, 2.0));
 ST_Z
------
    2
(1 row)


SELECT inza..ST_AsText(inza..ST_Z(inza..ST_Point(0.0, 1.0, 2.0),
5));
ST_ASTEXT
-----------
 POINT Z (0 1 5)
(1 row)


SELECT inza..ST_AsText(inza..ST_Z(inza..ST_Point(0.0, 1.0), 5));
ST_ASTEXT
-----------
 POINT Z (0 1 5)
(1 row)


SELECT inza..ST_AsText(inza..ST_Z(inza..ST_Point (3, 8, 23, 7,
4326), 40));
ST_ASTEXT
```

```
-----------
 POINT ZM (3 8 40 7)
(1 row)
```

Related Functions

- category Spatial
- ST_X
- ST_Y
- ST_M
- ST_Point

CHAPTER 3
Reference Documentation: Utilities

ST_CreateGeomColumn - Create the Geometry Column Table

This stored procedure creates the Geometry Column Table if it does not exists. It will preserve the table if it already exists.

Usage

The ST_CreateGeomColumn stored procedure has the following syntax:

- **ST_CreateGeomColumn()**
  - Returns
    BOOLEAN true on success and false on failure.

Examples

```
\c inza
set PATH=inza.inza;
call inza..ST_CreateGeomColumn();
 ST_CREATEGEOMCOLUMN
-------------
 f
(1 row)
```

Related Functions

- category Utilities - Actions

ST_CreateSpatialRefSys - Create the Spatial Reference System Table

This stored procedure creates the Spatial Reference System Table if it does not exists. It will preserve the table if it already exists.

Usage

The ST_CreateSpatialRefSys stored procedure has the following syntax:

- **ST_CreateSpatialRefSys()**
  - Returns
    BOOLEAN true on success and false on failure.

Examples

```
\c inza
set PATH=inza.inza;
call inza..ST_CreateSpatialRefSys();
 ST_CREATESPATIALREFSYS
------------
 f
(1 row)
```

Related Functions

- category Utilities - Actions

ST_MapPolygonsToGrid - Maps polygons to a grid

This stored procedure maps a table of geometries to grid cells.

Usage

The ST_MapPolygonsToGrid stored procedure has the following syntax:

- **ST_MapPolygonsToGrid(DOUBLE PRECISION GRIDSIZE, CHARACTER VARYING(ANY) SHAPETABLE, CHARACTER VARYING(ANY) SHAPECOLUMN, BOOLEAN DBG, INTEGER SHAPESRID, CHARACTER VARYING(ANY) SHAPEIDCOLUMN, BOOLEAN INCLUDE_ALL_COLUMNS)**

- Parameters
  - **GRIDSIZE**
    The Grid size in degrees. Allowable values are 1, .1 and .01.

    Type: DOUBLE PRECISION
  - **SHAPETABLE**
    The table containing the polygons to map.

    Type: CHARACTER VARYING(ANY)
  - **SHAPECOLUMN**
    Geometry column name for input table.

    Type: CHARACTER VARYING(ANY)
  - **DBG**
    Enable/Disable debug messages. This will leave all intermediate tables if you want to debug.

    Type: BOOLEAN
  - **SHAPESRID**
    The SRID used when calling ST_SpatialGridIndex.

    Type: INTEGER
  - **SHAPEIDCOLUMN**
    Identifier column for input data..

    Type: CHARACTER VARYING(ANY)
  - **INCLUDE_ALL_COLUMNS**
    This parameter optionally allows users to include all columns in the input table. If FALSE, it will create an output table with the following columns only ID_COLUMN, GEOM_COLUMN, GRID_ID, GRID_GEOMETRY.

    Type: BOOLEAN
- Returns
  INTEGER 0 if success and 1 if error.

Details

This stored procedure maps the passed in table's geometries to the specified grid cell using the grid table specified (1, 0.1, 0.01). If the grid table doesn't already exist, it will be created. The output is a new table with one row for each input geometry/grid cell intersection.

Examples

```
set PATH=inza.inza;

create table POINTS (ID INTEGER, MY_GEOM VARCHAR(64000));

insert into POINTS VALUES (1, inza..ST_WKTToSQL('Point (1.1
1.1)'));

insert into POINTS VALUES (2, inza..ST_WKTToSQL('Point (2.2
2.2)'));

insert into POINTS VALUES (3, inza..ST_WKTToSQL('Point (3.3
```

```
3.3)'));

alter table points owner to inzauser;

CALL
inza..ST_MAPPOLYGONSTOGRID(1,'POINTS','MY_GEOM',false,432
6,'ID',true);

select ID, inza..ST_ASTEXT(MY_GEOM), ONEGID,
inza..ST_ASTEXT(ONEGRID_GEOM) from POINTS_ONE_GRIDMAP;

drop table POINTS_ONE_GRIDMAP;

drop table POINTS;

drop table GRID_ONE_GEOMETRIES;

delete from GEOMETRY_COLUMNS where
F_TABLE_NAME='POINTS_ONE_GRIDMAP';
```

```
 ST_MAPPOLYGONSTOGRID
----------------------
                     0
(1 row)

 ID |    ST_ASTEXT    | ONEGID |               ST_ASTEXT
----+-----------------+--------
+-------------------------------------
  2 | POINT (2.2 2.2) |  92182 | POLYGON ((2 2, 2 3, 3 3,
3 2, 2 2))
  3 | POINT (3.3 3.3) |  93183 | POLYGON ((3 3, 3 4, 4 4,
4 3, 3 3))
  1 | POINT (1.1 1.1) |  91181 | POLYGON ((1 1, 1 2, 2 2,
2 1, 1 1))
(3 rows)
```

Related Functions

- category Utilities - Actions

ST_SpatialGridIndex - Creates a spatial grid index

This stored procedure creates a grid table.

Usage

The ST_SpatialGridIndex stored procedure has the following syntax:

- **ST_SpatialGridIndex(DOUBLE PRECISION GRIDSIZE, BOOLEAN DBG, INTEGER SRID)**
  - Parameters
    - **GRIDSIZE**
      The Grid size in degrees. Allowable values are 1, .1 and .01.

      Type: DOUBLE PRECISION
    - **DBG**
      Enable/Disable debug messages. This will leave all intermediate tables if you want to debug.

      Type: BOOLEAN
    - **SRID**
      The SRID used to initialize the grid.

      Type: INTEGER
  - Returns
    INTEGER 0 if success and 1 if error.

Details

This stored procedure creates a grid table of either 1, .1 or .01 degrees.

Examples

```
set PATH=inza.inza;
call inza..ST_SPATIALGRIDINDEX(1,'FALSE',4326);
select count(*) from grid_one_geometries;
drop table grid_one_geometries;
call inza..ST_SPATIALGRIDINDEX(0.1,'FALSE',4326);
select count(*) from grid_point1_geometries;
drop table grid_point1_geometries;
 ST_SPATIALGRIDINDEX
---------------------
                   0


(1 row)
 COUNT
-------
 64800
(1 row)
 ST_SPATIALGRIDINDEX
---------------------
```

```
                                0

(1 row)
  COUNT
---------
 6480000
(1 row)
```

Related Functions

- category Utilities - Actions

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