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Geogràfica i Teledetecció

Cosas que puedes hacer con PostGIS que quizás no sepas

XAVIER TORRET
Socio Director BGEO

BGEO
OPEN GIS & WATER SOLUTIONS

Geotech/Spatial Data Science, 14 y 15 de junio de 2023 | Girona

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"POSTGIS CAMBIÓ MI VIDA"

Geotech/Spatial Data Science, 14 y 15 de junio de 2023 | Girona

NUESTRA EMPRESA

Somos una empresa multicultural con sede en Barcelona con más de 15 años. Nos apasiona ayudar a las empresas de agua a mejorar sus procesos y resiliencia mediante el uso de soluciones de alta relación calidad-precio.

Nuestra visión es agua y saneamiento para todos, y nuestra misión es ser una empresa mundial impulsada por el conocimiento de los servicios públicos de agua.

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1) LA GÉNESIS DE LOS OBJETOS Y EL SEGUNDO PRINCIPIO DE LA TERMODINÁMICA

2) ¿DISEÑO Y PROGRAMACIÓN ORIENTADO A OBJETOS?

3) ¿PUEDEN SER LAS VISTAS EDITABLES?

4) EL MUNDO REAL Y EL MUNDO VIRTUAL

5) EL GOBIERNO EN LA SOMBRA: CONTROLANDO DESDE BACKEND

6) LOS SIETE GRANDES RETOS SUPERADOS

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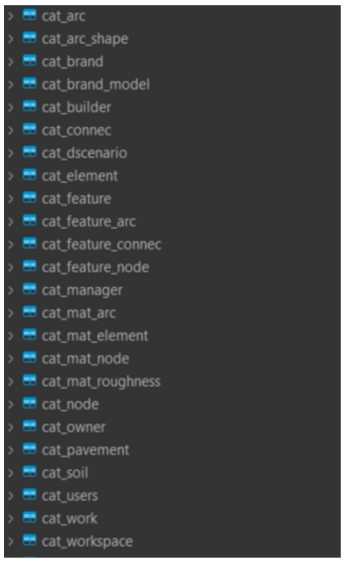
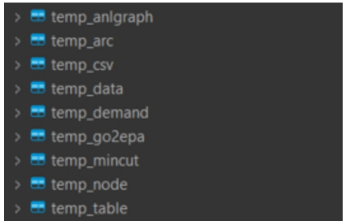
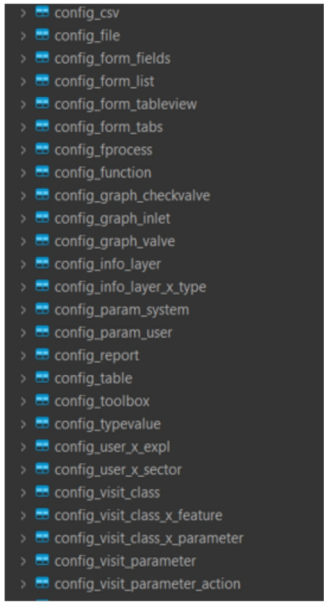
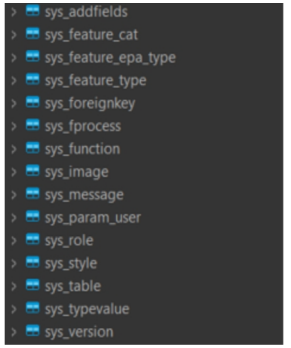
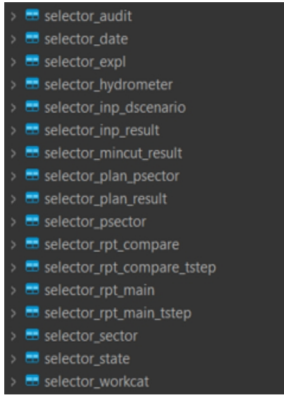
LA GÉNESIS DE LOS OBJETOS Y EL SEGUNDO PRINCIPIO DE LA TERMODINÁMICA











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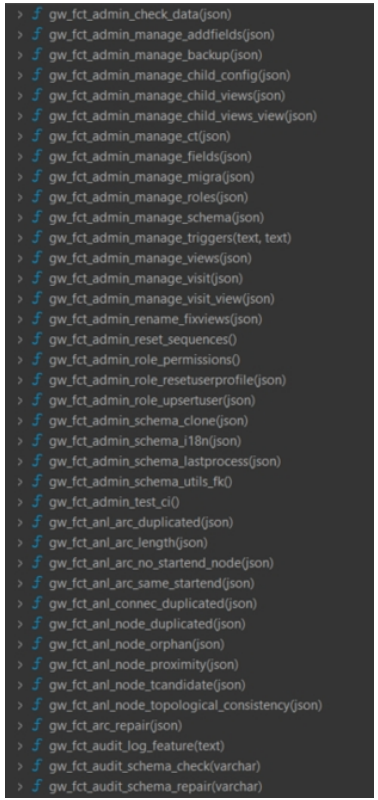

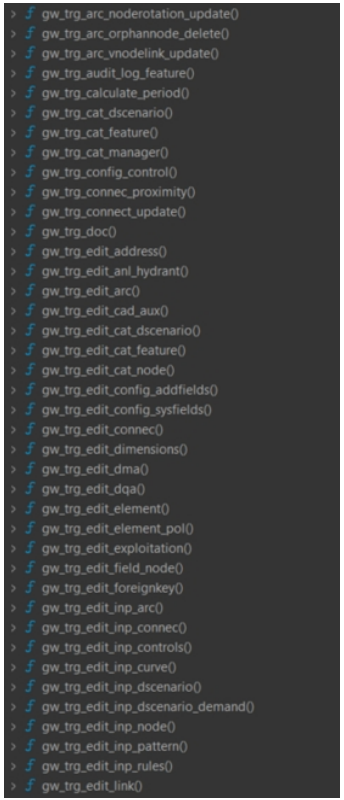

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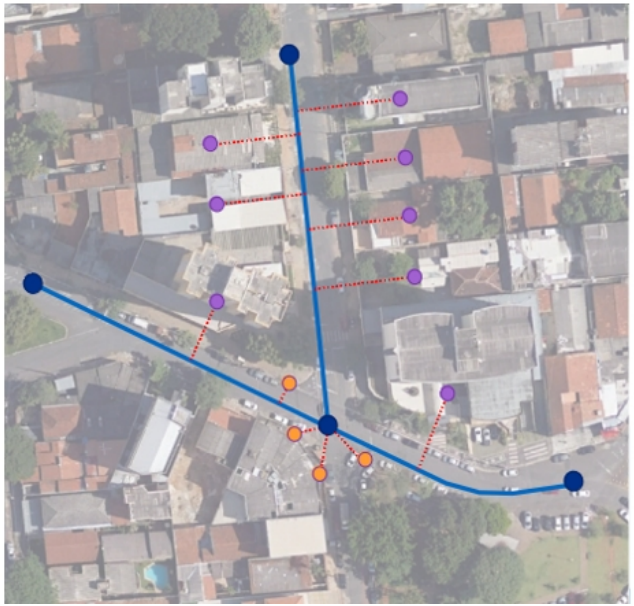
DISEÑO Y PROGRAMACIÓN ORIENTADO A OBJETOS



NODE

- node_id (varchar(16))
- code (varchar(30))
- elevation (numeric(12, 4))
- depth (numeric(12, 4))
- nodecat_id (varchar(30))
- epa_type (varchar(16))
- sector_id (int4)
- arc_id (varchar(16))
- parent_id (varchar(16))
- state (int2)

- district_id (int4)
- adate (text)
- adescript (text)
- accessibility (int2)
- workcat_id_plan (varchar(255))
- asset_id (varchar(50))

ARC

- arc_id (varchar(16))
- code (varchar(30))
- node_1 (varchar(16))
- node_2 (varchar(16))
- arccat_id (varchar(30))
- epa_type (varchar(16))
- sector_id (int4)
- state (int2)

- staticpressure (numeric(12, 3))
- district_id (int4)
- depth (numeric(12, 3))
- adate (text)
- adescript (text)
- workcat_id_plan (varchar(255))
- asset_id (varchar(50))
- pavcat_id (varchar(30))

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DISEÑO Y PROGRAMACIÓN ORIENTADO A OBJETOS

gw_trg_topocontrol_arc (before insert or update of the_geom, state on arc)

```
-- working without statetopocontrol
SELECT node.* INTO nodeRecord1 FROM node
JOIN cat_node ON cat_node.id=node.nodecat_id
JOIN cat_feature_node ON cat_feature_node.id = nodetype_id
WHERE ST_DWithin(ST_startpoint(NEW.the_geom), node.the_geom, v_arc_searchnodes) ORDER BY
(case when isarcdivide is true then 1 else 2 end),
ST_Distance(node.the_geom, ST_startpoint(NEW.the_geom)) limit 1;

SELECT node.* INTO nodeRecord2 FROM node
JOIN cat_node ON cat_node.id=node.nodecat_id
JOIN cat_feature_node ON cat_feature_node.id = nodetype_id
WHERE ST_DWithin(ST_endpoint(NEW.the_geom), node.the_geom, v_arc_searchnodes) ORDER BY
(case when isarcdivide is true then 1 else 2 end),
ST_Distance(node.the_geom, ST_endpoint(NEW.the_geom)) limit 1;
```

gw_trg_topocontrol_node (after insert or update of the_geom, state on node)

```
-- check existing state=1 nodes
SELECT * INTO node_rec FROM node WHERE ST_DWithin(NEW.the_geom, node.the_geom, v_node_proximity) AND node.node_id != NEW.node_id AND node.state=1;
IF node_rec.node_id IS NOT NULL THEN

    IF v_dsbl_error IS NOT TRUE THEN
        EXECUTE 'SELECT gw_fct_getmessage($${"client":{"device":4, "infoType":1, "lang":"ES"},"feature":{},
        "data":{"message":"1097", "function":"1334","debug_msg":"'||NEW.node_id||'"}}$$);';
    ELSE

        SELECT concat('ERROR-',id,':',error_message,'.',hint_message) INTO v_message FROM sys_message WHERE id = 1097;
        INSERT INTO audit_log_data (fid, feature_id, log_message) VALUES (106, NEW.node_id, v_message);
    END IF;
END IF;
```

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¿PUEDEN SER LAS VISTAS EDITABLES?

cat_feature

id	system_id	feature_type	shortcut_key	parent_layer	child_layer	descript	link_path	code_autofill	active	config
PR_BREAK_VALVE	VALVE	NODE	*NULL*	v_edit_node	ve_node_pr_break_valve	Pressure break valve	*NULL*	true	true	*NULL*
PR_SUSTA_VALVE	VALVE	NODE	*NULL*	v_edit_node	ve_node_pr_susta_valve	Pressure sustainer valve	*NULL*	true	true	*NULL*
CONTROL_REGISTER	REGISTER	NODE	*NULL*	v_edit_node	ve_node_control_register	Control register	*NULL*	true	true	*NULL*
FL_CONTR_VALVE	VALVE	NODE	*NULL*	v_edit_node	ve_node_fl_contr_valve	Flow control valve	*NULL*	true	false	*NULL*
GEN_PURP_VALVE	VALVE	NODE	*NULL*	v_edit_node	ve_node_gen_purp_valve	General purpose valve	*NULL*	true	false	*NULL*
THROTTLE_VALVE	VALVE	NODE	*NULL*	v_edit_node	ve_node_throttle_valve	Throttle-valve	*NULL*	true	false	*NULL*
ADAPTATION	JUNCTION	NODE	*NULL*	v_edit_node	ve_node_adaptation	Adaptation junction	*NULL*	true	false	*NULL*
BYPASS_REGISTER	REGISTER	NODE	*NULL*	v_edit_node	ve_node_bypass_register	Bypass-register	*NULL*	true	false	*NULL*
VALVE_REGISTER	REGISTER	NODE	*NULL*	v_edit_node	ve_node_valve_register	Valve register	*NULL*	true	false	*NULL*

sys_addfields

id	param_name	cat_feature_id	is_mandatory	datatype_id	orderby	active	iseditable
2	outfallvalve_param_1	OUTFALL_VALVE	falso	text	1	true	verdadero
4	outfallvalve_param_2	OUTFALL_VALVE	falso	boolean	2	true	verdadero
6	shtvalve_param_1	SHUTOFF_VALVE	falso	text	1	true	verdadero

¿PUEDEN SER LAS VISTAS EDITABLES?

ve_node_*

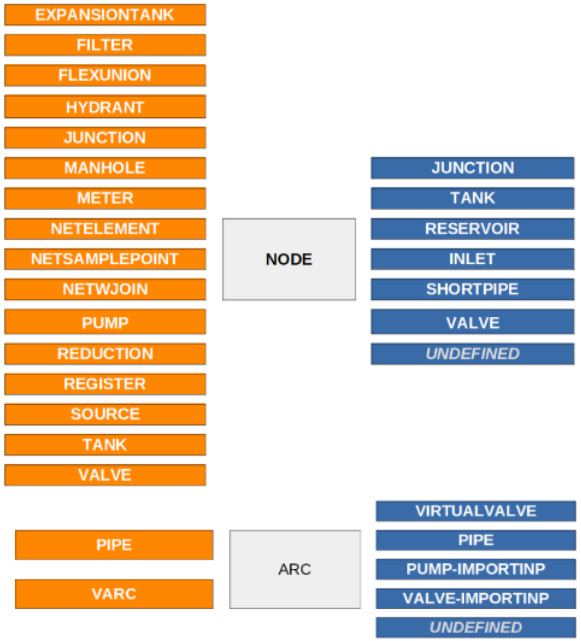
```
FROM ws_sample.ve_node
  JOIN ws_sample.man_meter ON man_meter.node_id::text = ve_node.node_id::text
  LEFT JOIN ( SELECT ct.feature_id,
        ct.pressmeter_param_1,
        ct.pressmeter_param_2
       FROM crosstab('SELECT feature_id, parameter_id, value_param
       FROM ws_sample.man_addfields_value LEFT JOIN ws_sample.sys_addfields ON sys_addfields.id=parameter_id
       JOIN ws_sample.v_state_node ON node_id = feature_id
       WHERE value_param IS NOT NULL AND cat_feature_id=''PRESSURE_METER'' OR cat_feature_id is null  ORDER BY 1,2'::text,
       'VALUES (''24''),(''26'')'::text) ct(feature_id character varying, pressmeter_param_1 text, pressmeter_param_2 date)) a
       ON a.feature_id::text = ve_node.node_id::text
WHERE ve_node.node_type::text = 'PRESSURE_METER'::text;
```

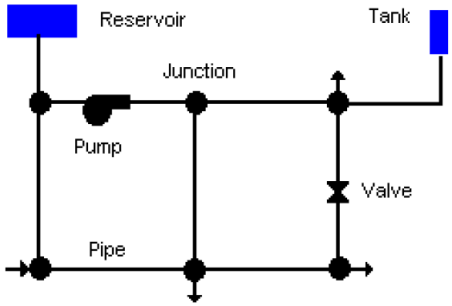
gw_trg_edit_node

```
-- man addfields update
IF v_customfeature IS NOT NULL THEN
    FOR v_addfields IN SELECT * FROM sys_addfields
    WHERE (cat_feature_id = v_customfeature OR cat_feature_id is null) AND active IS TRUE AND iseditable IS TRUE

        EXECUTE 'SELECT $1."' || v_addfields.param_name||'"'
            USING NEW
            INTO v_new_value_param;

        EXECUTE 'SELECT $1."' || v_addfields.param_name||'"'
            USING OLD
            INTO v_old_value_param;

        IF v_new_value_param IS NOT NULL THEN

            EXECUTE 'INSERT INTO man_addfields_value(feature_id, parameter_id, value_param) VALUES ($1, $2, $3)
                ON CONFLICT (feature_id, parameter_id)
                DO UPDATE SET value_param=$3 WHERE man_addfields_value.feature_id=$1 AND man_addfields_value.parameter_id=$2'
                USING NEW.node_id , v_addfields.id, v_new_value_param;

        ELSIF v_new_value_param IS NULL AND v_old_value_param IS NOT NULL THEN

            EXECUTE 'DELETE FROM man_addfields_value WHERE feature_id=$1 AND parameter_id=$2'
                USING NEW.node_id , v_addfields.id;
        END IF;

    END LOOP;
END IF;
```

EL MUNDO REAL Y EL MUNDO VIRTUAL

https://github.com/Giswater/giswater_dbmodel/wiki/EPANET-dual-dbmodel





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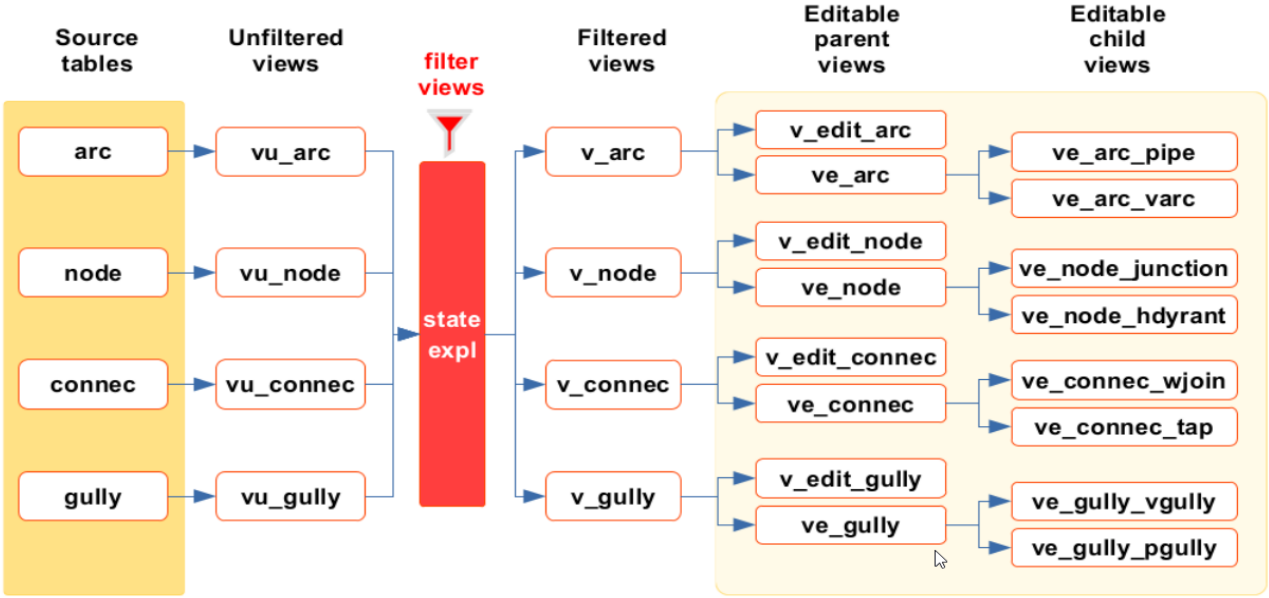
EL GOBIERNO EN LA SOMBRA: CONTROLANDO DESDE BACKEND

https://github.com/Giswater/giswater_dbmodel/wiki/feature-views-strategy



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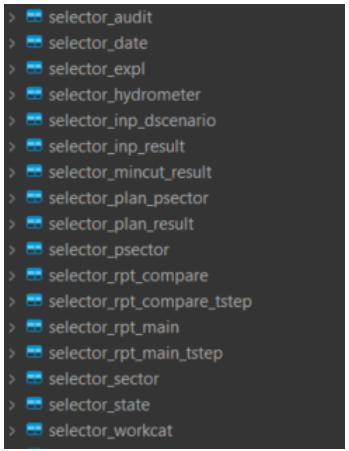

v_state_arc

```
SELECT arc.arc_id
  FROM ws_sample.selector_state,
   ws_sample.selector_expl,
   ws_sample.arc
WHERE arc_state = selector_state.state_id AND arc.expl_id = selector_expl.expl_id
  AND selector_state.cur_user = "current_user"()::text
  AND selector_expl.cur_user = "current_user"()::text
```

v_state_node

```
SELECT node.node_id
  FROM ws_sample.selector_state,
   ws_sample.selector_expl,
   ws_sample.node
WHERE node_state = selector_state.state_id AND node.expl_id = selector_expl.expl_id
  AND selector_state.cur_user = "current_user"()::text
  AND selector_expl.cur_user = "current_user"()::text
```

v_state_connec

```
SELECT connec.connec_id,
   connec.arc_id,
   1 AS flag
  FROM ws_sample.selector_state,
   ws_sample.selector_expl,
   ws_sample.connec
WHERE connec_state = selector_state.state_id AND connec.expl_id = selector_expl.expl_id
  AND selector_state.cur_user = "current_user"()::text
  AND selector_expl.cur_user = "current_user"()::text
```

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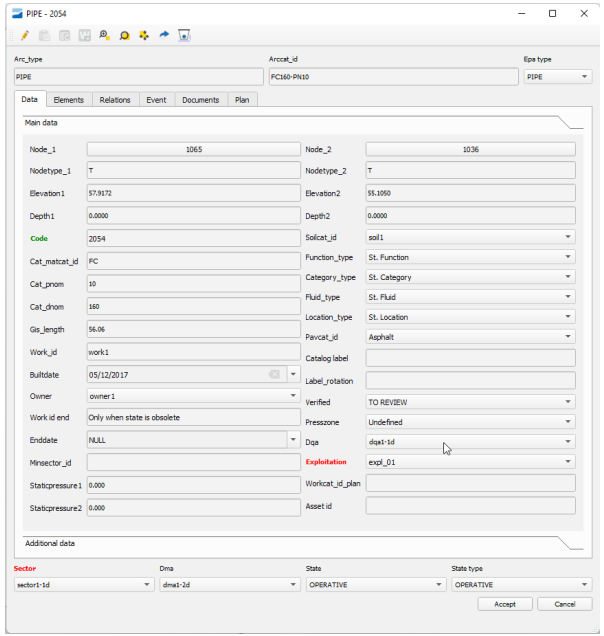

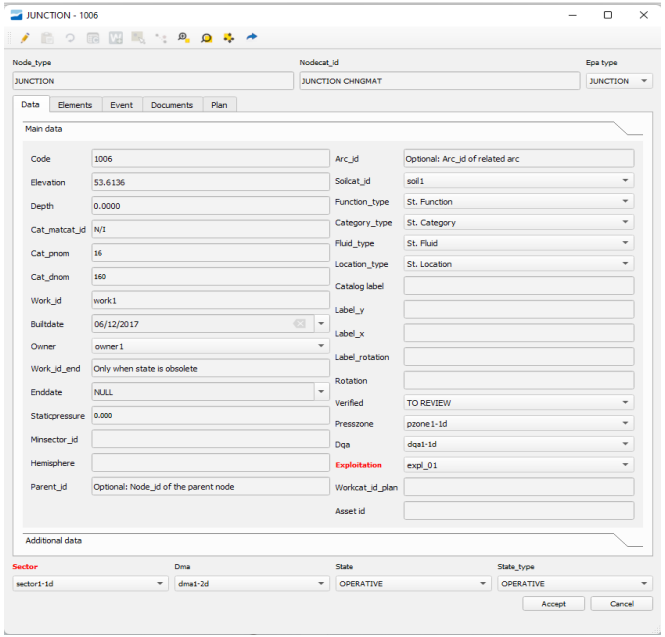

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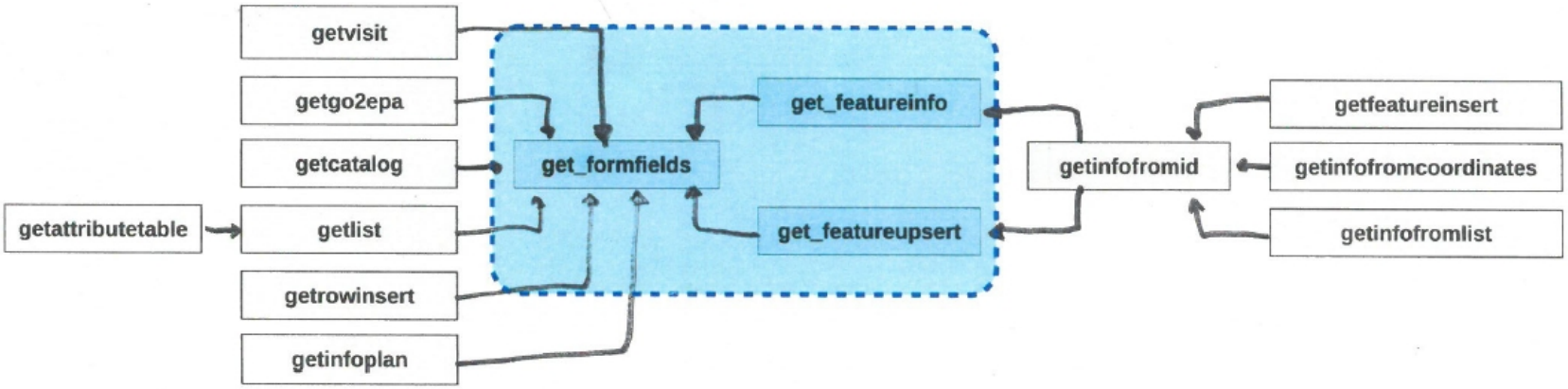

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gw_fct_getformfields (varchar, varchar, varchar, varchar, varchar, varchar, varchar, varchar, varchar, int4, json

```
v_querystring = concat('SELECT array_agg(row_to_json(a)) FROM (

    WITH typevalue AS (SELECT * FROM config_typevalue)

    SELECT ',v_label,', columnname, columnname as column_id, concat(',quote_literal(p_tabname),',''_'',columnname) AS widgetname, widgettype,
    widgetfunction,', v_device,' hidden, datatype , tooltip, placeholder, iseditable, row_number()over(ORDER BY layoutname, layoutorder) AS orderby,
    layoutname, layoutorder, dv_parent_id AS "parentId", isparent, ismandatory, linkedobject, dv_querytext AS "queryText", dv_querytext_filterc AS "queryTextFilter", isautoupdate,
    dv_orderby_id AS "orderById", dv_isnullvalue AS "isNullValue", stylesheet, widgetcontrols, web_layoutorder
    FROM config_form_fields
    LEFT JOIN config_typevalue a ON a.id = widgetfunction::json->>''functionName'' AND a.typevalue = ''widgetfunction_typevalue''
    LEFT JOIN config_typevalue b ON b.id = widgettype AND b.typevalue = ''widgettype_typevalue''

    WHERE formname = ',quote_nullable(p_formname),' AND formtype= ',quote_nullable(p_formtype),' ',v_clause,' ',v_filter_widgets,' ORDER BY orderby) a');

v_debug_vars := json_build_object('v_label', v_label, 'p_tabname', p_tabname, 'v_device', v_device, 'p_formname', p_formname, 'p_formtype', p_formtype, 'v_clause', v_clause);
v_debug_sql := json_build_object('querystring', v_querystring, 'vars', v_debug_vars, 'funcname', 'gw_fct_getformfields', 'flag', 10);
SELECT gw_fct_debugsql(v_debug_sql) INTO v_msgerr;
EXECUTE v_querystring INTO fields_array;
```

config_form_fields

	formname	formtype	tabname	columnname	layoutname	layoutorder	datatype	widgettype	label	tooltip	placeholder	ismanc	isparent	ise	isautoupdat	isfilter	dv_querytext
1	v_plan_result_arc	form_feature	main	y1	[NULL]	[NULL]	double	text	y1	[NULL]	[NULL]	[ ]	[ ]	[ ]	[ ]	[NULL]	[NULL]
2	v_plan_result_arc	form_feature	main	area	[NULL]	[NULL]	double	text	area	[NULL]	[NULL]	[ ]	[ ]	[ ]	[ ]	[NULL]	[NULL]
3	price_compost	form_feature	main	id	[NULL]	[NULL]	string	text	id	[NULL]	[NULL]	[ ]	[ ]	[v]	[ ]	[NULL]	[NULL]
4	v_plan_result_arc	form_feature	main	z1	[NULL]	[NULL]	double	text	z1	[NULL]	[NULL]	[ ]	[ ]	[ ]	[ ]	[NULL]	[NULL]
5	v_ext_streetaxis	form_feature	main	descript	lyt_data_3	13	text	text	descript	[NULL]	[NULL]	[ ]	[ ]	[v]	[ ]	[NULL]	[NULL]

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EL GOBIERNO EN LA SOMBRA: CONTROLANDO DESDE BACKEND

https://github.com/Giswater/giswater_dbmodel/wiki/Use-existing-PLpgSQL-function

Are you planning to develop new applications interacting with Giswater database?

Here you can find functions we have used in our database model ready to work with you. Functions json/json ready to build-up a Web Service and interact with your new development. More info:

- Actions
- Admin
- Data quality
- Feature accesor
- Feature editor
- File I/O
- Graph analysis
- Topology analysis

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List of Action functions

- gw_fct_getcatalog
- gw_fct_getchilds
- gw_fct_getcolumnsfromid
- gw_fct_getconfig
- gw_fct_getdimensioning
- gw_fct_getlist
- gw_fct_getmincut
- gw_fct_getpermissions
- gw_fct_getprint
- gw_fct_getprofilevalues
- gw_fct_getsearch
- gw_fct_getselectors
- gw_fct_gettoolbox
- gw_fct_getunexpected
- gw_fct_getvisit
- gw_fct_psector_duplicate
- gw_fct_setcheckproject
- gw_fct_setconfig
- gw_fct_setdelete

List of Admin functions

- gw_fct_admin_manage_addfields
- gw_fct_admin_manage_backup
- gw_fct_admin_manage_child_views
- gw_fct_admin_manage_ct
- gw_fct_admin_manage_fields
- gw_fct_admin_manage_visit
- gw_fct_admin_role_resetuserprofile
- gw_fct_admin_role_upsertuser
- gw_fct_admin_schema_clone

List of Graph analysis functions

- gw_fct_graphanalytics_dowstream
- gw_fct_graphanalytics_flowtrace
- gw_fct_graphanalytics_lrs
- gw_fct_graphanalytics_mapzones
- gw_fct_graphanalytics_mincutzones
- gw_fct_graphanalytics_minsector
- gw_fct_graphanalytics_upstream

List of Data quality functions

- gw_fct_grafanalytics_check_data
- gw_fct_om_check_data
- gw_fct_pg2epa_check_data
- gw_fct_pg2epa_check_network
- gw_fct_pg2epa_check_options
- gw_fct_pg2epa_check_result
- gw_fct_plan_check_data

List of Feature accessor functions

- gw_fct_getcheckdelete
- gw_fct_getfeatureinsert
- gw_fct_getfeaturerelation
- gw_fct_getinfocrossection
- gw_fct_getinfofromcoordinates
- gw_fct_getinfofromid
- gw_fct_getinfofromlist
- gw_fct_getinfoplan
- gw_fct_getlayersfromcoordinates

List of Topology analysis functions

- gw_fct_anl_arc_intersection
- gw_fct_anl_arc_inverted
- gw_fct_anl_arc_no_startend_node
- gw_fct_anl_arc_same_startend
- gw_fct_anl_connec_duplicated
- gw_fct_anl_node_duplicated
- gw_fct_anl_node_exit_upper_intro
- gw_fct_anl_node_flowregulator
- gw_fct_anl_node_orphan
- gw_fct_anl_node_proximity
- gw_fct_anl_node_sink
- gw_fct_anl_node_topological_consistency

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EL GOBIERNO EN LA SOMBRA: CONTROLANDO DESDE BACKEND

https://github.com/Giswater/giswater_dbmodel/wiki/PLpgSQL-function-input-parameters

```
"client":{
"device":4, ->> Device type: 1-mobile, 2-tablet, 3-web, 4-desktop
"infoType":1, ->> Info type: 1-full, 2-reduced
"lang":"es_ES", ->> Language of client
"epsg":25831}, ->> Srid of map
"cur_user":"test_user"}, ->> Name of current user
}

"form":{
"formName":"upsert_catalog_arc", ->> Name of the form
"tabName":"data", ->> Name of the tab
"editable":"TRUE", ->> Force editability of form
"formTabs":{"active":true, "fields":{}} ->> Tabs of form
}

"feature":{
"featureType":"arc", "feature_type: "ARC", "type":"ARC", ->> Feature type. Need to be harmonized
"tableName":"ve_arc_pipe", ->> Name of the table related to feature
"idName":"arc_id", ->> Name of the column wich acts as primary key on related table
"id":"2001", ->> Id of element
"catFeature":"PUMP" ->> Catalog of element
}
```

https://github.com/Giswater/giswater_dbmodel/wiki/PLpgSQL-function-output-parameters

```
"status":"Accepted", ->> Status of the response: Accepted, Failed
"message":{ ->> Message of response
"level":1, ->> Criticity of message: 0-OK, 1-WARNING, 2-ERROR
"text": "Hello world"}, ->> Text of message
"version":"3.5.024" ->> Backend version
```

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LOS SIETE GRANDES APRENDIZAJES

1) EL ORDEN DE LAS COSAS

2) VISTAS EDITABLES CON TRIGGER DINÁMICO

3) ESTRATEGIA DE CONTROL EN BACKEND (SELECTORES, DIÁLOGOS, API)

4) PERFORMANCE (INDICES, SQL vs PL-SQL, TABLAS TEMPORALES, TABLESPACES)

5) ESTRATEGIAS DE DEBUG EN PL-PGSQL

6) POSTGRES FORWARD COMPATIBILITY

7) NO HAY MANERA DE USAR UN BUEN ADMINISTRADOR DE CÓDIGO LIBRE

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BIG THANK YOU TO POSTGIS!

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