



PLATINUM **SOFTWARE**

PlatSoft Grape Manual

Developer's guide to using the PlatSoft Grape Framework

Table of Contents

1. Grape	Page 4
1.1. Architecture	Page 5
1.2. Getting started	Page 5
1.3. Directory layout	Page 5
1.4. API Calls	Page 6
1.4.1. FS Request	Page 6
1.4.2. DB API requests	Page 6
1.4.2.1. Registering the API call using schemas	
1.4.2.1.1. Validation	
1.4.2.2. JavaScript API handlers	
1.4.2.3. Non-JSON returning API calls	
1.4.3. Access control	Page 10
1.4.4. Consuming an API call	Page 10
1.5. Database	Page 10
1.5.1. Defining the database structure	Page 11
1.5.1.1. Database model	
1.5.1.2. Database functions	
1.5.1.3. Initial data	
1.5.1.4. Naming conventions	
1.5.1.5. Pitfalls to avoid	
1.5.2. Creating the database	Page 11
1.6. Sending Emails	Page 12
1.6.1. Setup	Page 12
1.6.2. Send an email from PostgreSQL	Page 12
1.6.3. Send an email through an API call	Page 12
1.6.4. Custom headers	Page 12
1.6.5. Email templates	Page 12
1.6.6. Example	Page 14
1.7. Generating PDF Files	Page 14
1.7.1. XML-producing SQL function	Page 15
1.7.2. XSL file	Page 15
1.7.3. API handler	Page 15
1.8. Grape settings	Page 15
1.8.1. Known Grape settings	Page 15
1.9. Grape config file	Page 16
1.10. Standardized Error Codes	Page 17
1.11. Built-in API calls	Page 17
1.11.1. GrapeDeleteRecord	Page 17
1.11.2. GrapeInsertRecord	Page 18
1.11.3. GrapeListQuery	Page 19
1.11.4. GrapeSendMail	Page 19
1.11.5. GrapeUpdateRecord	Page 20
1.11.6. GrapeUserSave	Page 20
1.11.7. download_public_js_files	Page 21
1.12. Grape SQL Functions	Page 21
1.12.1. API result functions	Page 21
1.12.2. Data importing functions	Page 22
1.12.3. JSON helpers	Page 22

1.12.4. List query	Page 22
1.12.5. Table Operations	Page 23
1.12.6. Reports	Page 23
1.12.7. User related functions	Page 24
1.12.8. Session related functions	Page 24
1.12.9. Other utility functions	Page 25

1. GRAPE

Note! This section deals mostly with the backend functionality of systems. For information on the user interface, see "Grape User Interface"

Grape is a framework and set of processes developed internally by Platinum Software. It is implemented as an Express.js app. A Grape application provides an HTTP/S interface for web clients to connect to.

Grape deals with the following in an application:

- [Access control](#)
- Session management
- Database connections
- Relaying [API calls](#) to handlers (DB functions or Javascript)
- Serving static files

Other functionality provided for developers, are:

- [Sending emails](#) (generated with templates)

1.1 Architecture

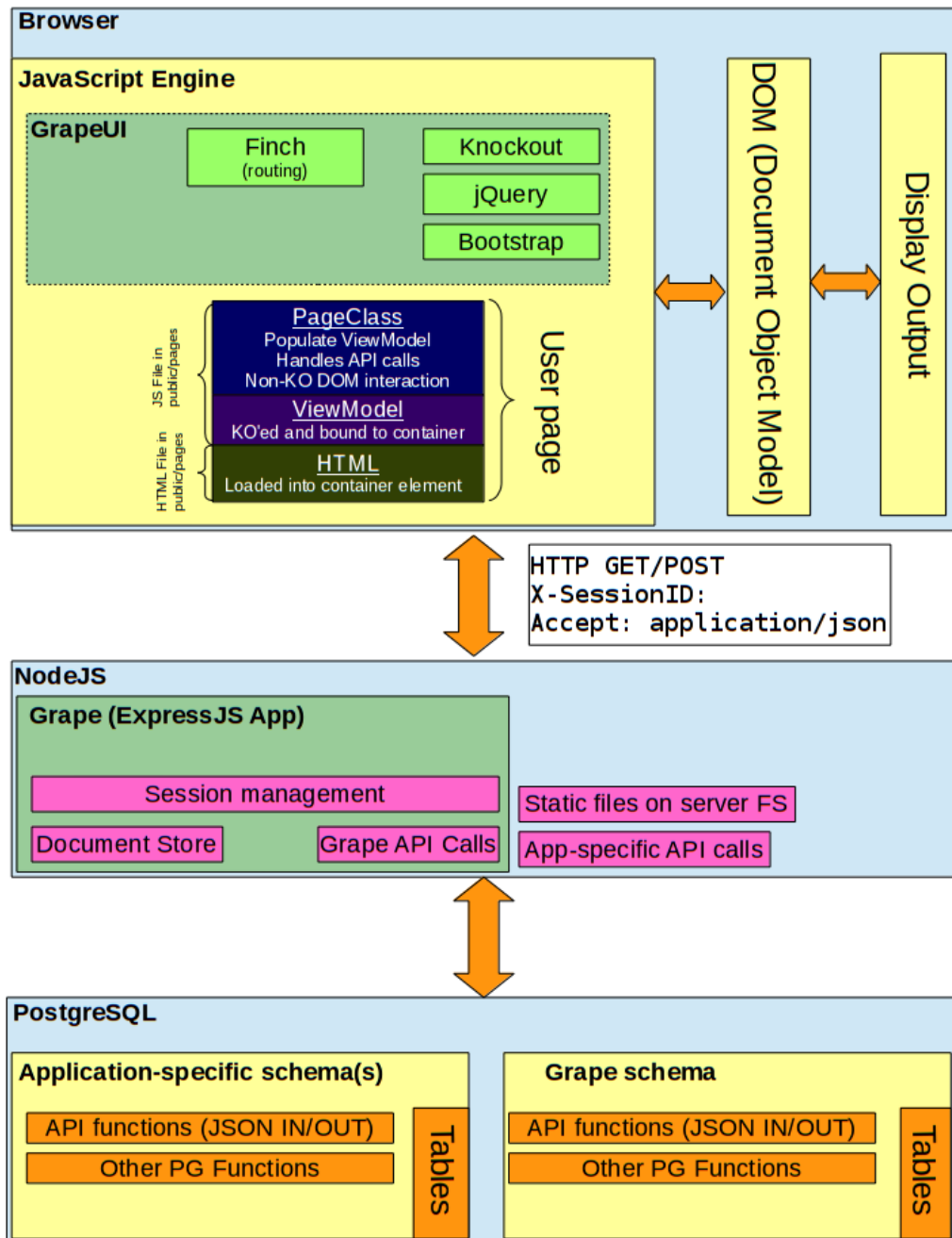


Fig. 1: Grape Architecture

1.2 Getting started

The tool `grape_init` is a script which makes it easy to create a new empty Grape application. It is available from the Grape Tools repo (`npm install -g grape_tools`).

1.3 Directory layout

Most Grape applications will have the following directories/files:

- `api/` - API routes to be loaded and registered by Node on startup
- `db/` - Database-related files (mostly SQL)
- `public/` - Public (HTML, Frontend JavaScript and CSS files). See Grape Frontend Development for more information regarding the contents of this directory
- `grape-ui/` - Public (HTML, Frontend JavaScript and CSS files) for GrapeUI components

- *scripts/* - Scripts
- *log/* - Log files
- *node_modules/* - This directory is automatically generated by npm when installing modules
- [config.js](#) - Grape config file (should not be checked into the repo)
- [config.js.example](#) - Example Grape config file
- *index.js* - Application entry point
- *default_config.js* - Grape config file containing product-specific settings
- [email_templates](#) - Email templates

1.4 API Calls

Grape classifies between 3 different types of API calls:

1. Filesystem request: the browser requests a file from the filesystem (for example an HTML, CSS, JS or image file) */download*, will fall under this category. This includes the initial call for *index.html*. Files are searched for in the directories listed in the Grape config setting [public directories](#), in the order that it is specified in the setting. The first file found matching the path (relative to any public directory) and filename is served.
2. Database API request: the API handler is implemented as a database function, accepting and returning a JSON object
3. JavaScript API request: the API handler is implemented as a JavaScript function, and handled completely in the Node.JS environment

1.4.1 FS Request

The first and most simple is a request for a file on the filesystem. A request that does not accept JSON, and does not start with */download*, will fall under this category. This includes the initial call for *index.html*. Files are searched for in the directories listed in the Grape config setting [public directories](#), in the order that it is specified in the setting. The first file found matching the path (relative to any public directory) and filename is served.

1.4.2 DB API requests

Database API calls are the most commonly used API calls. The logic for the function is typically implemented as a function in PostgreSQL. The function being called in the database accepts a JSON parameter, and returns a JSON object with the result.

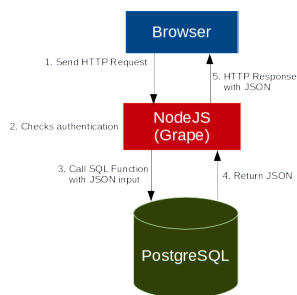


Fig. 2: Anatomy of a DB API

The logic of the function needs to be implemented in PostgreSQL. For example, a function calculating the square root of a number:

```

CREATE OR REPLACE FUNCTION maths_sqrt (JSON) RETURNS JSON AS $$
DECLARE
    _value NUMERIC;
    _result NUMERIC;
BEGIN

    _value := ($1->>'value')::NUMERIC; -- Extract values from JSON

    _result := sqrt(_value);           -- Calculation
  
```

```
RETURN grape.api_success('result', _result); -- Build and return JSON object
END; $$ LANGUAGE plpgsql;
```

The database function needs to be registered against an Express route in GrapeApp. There are two ways to do this: using a schema file, or registering it manually.

1.4.2.1 Registering the API call using schemas

Note! This method of creating DB API calls was introduced in Grape 1.0.4

APIs can be defined using a format based on the JSON Schema standard (<http://json-schema.org>), with added fields. On start-up, all the directories in the project's [api directory](#) config setting is traversed for JSON files. JSON files are then parsed, and must contain a single object, or an array of objects describing the API calls.

The fields in a schema object:

```
{
  "description": "API call description",
  "id": "URL of the call",
  "name": "CamelCase name for this call",
  "sqlfunc": "SQL function",
  "type": "Body type (default to object)",
  "properties": { Set of properties in this body },
  "return": {
    "type": "Return type (default to object)"
    "properties": { Set of properties in this body }
    "example": { Example of a resulting JSON }
  }
}
```

The `properties` field, which is used with the "object" type, is an associative array with the field name as key, and the field properties as the object. For example:

```
"properties": {
  "number_field": {"type": "number", "description": "Number field 1"},
  "string_field": {"type": "string", "description": "A strings field"},
  "array_field": {"type": "array", "items": {
    "type": "string"
  },
  "description": "List of strings"
}
```

An example of a schema definition for the sqrt function:

```
{
  "description": "Calculate the square root of a number",
```

```

    "id": "/maths/sqrt",
    "name": "SquareRoot",
    "sqlfunc": "maths_sqrt",
    "type": "object",
    "properties": {
      "value": { "type": "number", "description": "The input value for the square root function" }
    },
    "result": {
      "type": "object",
      "properties": {
        "result": { "type": "number", "description": "The resulting number" },
        "status": { "enum": ["ERROR", "OK"]}
      }
    }
  }
}

```

1.4.2.1.1 Validation

If the API call's method is POST, the received body will be validated against the JSON schema (the fields in the *properties*). When the properties field cannot be used (for example in GET calls), an **validate** field can be specified. This field contains a string, in the following format:

Validate string syntax:

```

begin_expr ::= "(" <begin_expr> "," <param-def> ")"
param-def  ::= <param-name> ":" <data-type> <modifier-list>
modifier-list ::= <opt-modifier> <modifier-list>
opt-modifier ::= "*" | "E" | "0" | ""
data-type   ::= "s" | "i" | "f" | "b" | "d" | "t" | "a"

```

Data types:

```

s text
i integer
f float
b boolean
d date
t date

```

Modifiers:

```

* optional is true (default = false)
E Empty becomes null
0 Nullable

```

Examples:

```

(batch_labreport_id: i, product_id: i, labreport)

```

Note! More examples are available in the grape repository, in the **examples/** subdirectory

1.4.2.2 JavaScript API handlers

API calls that are handled by JavaScript functions, can be found in the project's [api_directory](#) (set in the config, usually *api/*). On startup, these directories are traversed for *.js files and included in the application. API calls are registered using *app.get* and *app.post*. For example, the contents of a JS file in the *api/* directory:

```
exports = module.exports = function(app) {
    app.get("/maths/sqrt/:value", function (req, res) { /* Logic here */ });
}
```

Example of an API call, calling a database function:

```
exports = module.exports = function(app) {
    // register the route
    app.get("/maths/sqrt/:value", api_maths_sqrt);
}
function api_maths_sqrt (req, res)
{
    // call the stored procedure for this API call
    res.locals.db.json_call("maths_sqrt", // the name of the PL/pgSQL function
        {value: req.params.value},      // Build the JSON object as input for this function
        null,                          // Optional callback (not used here)
        {response: res}                // Send the response to res
    );
}
```

API calls should be documented using a standard based on the doxygen style. These comments can be extracted from the code using the *autogen_api_documentation.sh* script in grape-tools to create human-readable documentation. This is especially important for front-end developers, who can then use this documentation to interact with the API calls. All projects should have API documentation ready for clients to use.

A comment block containing documentation for an API call:

```
/**
 * @api URL The URL of the API call
 * @desc DESCRIPTION Description of the API call
 * @method GET/POST HTTP Method
 * @sqlfunc SQL_FUNCTION_NAME The SQL function used by this API call
 * @param NAME TYPE DESCRIPTION OPTIONAL DEFAULT When documenting GET requests, specify the
 *                                     input parameters using @param
 * @returnsample JSON Example JSON of a successful return call
 * @return DESCRIPTION Description of the return values
 *
 */
```

The *autogen_api_documentation.sh* script from grape-tools (*grape_tools/generate_docs/autogen_api_documentation.sh*) can be used to create API documentation from properly documented API calls.

```
$ autogen_api_documentation.sh API_DIRECTORY OUTPUT_FILE.vxml
```

1.4.2.3 Non-JSON returning API calls

An API call that is handled by a JavaScript call and needs to return something other than a JSON object, starts with `/download`.

1.4.3 Access control

Grape manages authentication, sessions, users, passwords and provide access control. Sessions are tracked using a session ID. Session IDs are obtained by making a call to **POST** `/grape/login`, providing a valid username and password. On success, this call will return with the session ID, the user's ID, username, roles and employee GUID. In subsequent calls, the session ID is sent to the server using a custom header **X-SessionID** in the HTTP requests.

Users and user-related information is stored in `grape.user`. Users can belong to one or more access roles, stored in `grape.access_path`. The link-table for these are `grape.user_role`.

Grape includes the following roles and access paths by default:

ROLE	DESCRIPTION	PATHS ALLOWED
guest	No or invalid login	<ul style="list-style-type: none"> <code>/grape/login</code>
all	All logged in users	<ul style="list-style-type: none"> <code>/lookup/*</code> <code>/grape/list</code> <code>/grape/api_list</code>
admin	Administrator	<ul style="list-style-type: none"> <code>*</code> (all paths allowed)

Access control is applied to all API calls. Before the API call is executed, the session is validated. If it cannot be validated, the default role **guest** is used. All users belongs to one or more roles, and always to the role named **all**. API calls are registered in the database (table `access_path`) by **path**, **method** and the **role** allowed. The **path** is a regular expression, matching the incoming URL of the request.

Note! The SQL function `grape.add_access_path (_path TEXT, _roles TEXT[], _methods TEXT[])` can be used to add a new access path. For initial data, this is kept in the project's `db/data/access_paths.sql`

1.4.4 Consuming an API call

In order to use an API call, you will need to know the following:

1. The URL of the call. This will look like a typical path, for example `/login`
2. The call method. This will usually be **GET** or **POST**
3. The input parameters. If the call's method is POST, this will be a JSON object containing fields. If it is GET, the input parameters are found in the URL

The API is consumed by making a HTTP request to the URL with the appropriate input parameters or body. Usually, session information will be sent in the HTTP headers.

1.5 Database

Grape interacts heavily with a database. Users, sessions and other data is stored in the database. Functions are defined here, and most business logic happen in the database. The following subdirectories can be found in a project's `db/` directory.

- **schema/** - The database schema file (**.dbm file** - created in [pgModeler](#), and exported DDL to SQL files
- **function/** - Directories and files containing database functions
- **process/** - Files containing database functions related to [background processes](#)
- **data/** - Files containing initial data for the system

- **deployments/** - Containing subdirectories for specific deployments. See the section Deployments for more information regarding this

1.5.1 Defining the database structure

1.5.1.1 Database model

pgModeler is a database modelling tool specifically designed for PostgreSQL. The model are saved in a DBM (*.dbm) file, and exported to a *.sql file. Usually, both **.dbm** files and the corresponding **.sql** files are added to the repositories. The sql files are always generated by pgModeler and should never be edited manually. The DBM file is saved in **db/schema/PROJECTNAME.dbm**. From within pgModeler, the SQL should be exported to a file **db/schema/PROJECTNAME.sql**. When the database is created, this file will be loaded.

1.5.1.2 Database functions

Database functions (like API call handlers or business logic) usually resides in **db/function/**. Files should be properly named, and functions grouped together in files, in a way that is understandable to someone who is not familiar with the code. Files should be all lower-case, and words split by underscore.

1.5.1.3 Initial data

TODO The data/ directory.

1.5.1.4 Naming conventions

- Keep table names lowercase, with words separated by underscore
- If a relation (table) has an id/unique column (which should be the case in most tables), add '_id' to the table name. For example, table policy has an ID column called **policy_id**. Note that there are security risks involved in using an auto-incrementing column where the value of such column are exposed to clients, or untrusted personnel.
- Use a 'v_' prefix for views, for example **v_policy**
- Use a 'mv_' prefix for materialized views, for example **mv_policy_address**
- Use a '_idx' suffix for indexes, for example **policy_id_idx**
- Use a '_fk' suffix for foreign key constraints, with an abbreviation of the tablename as prefix, for example **po_policy_id_fk**

1.5.1.5 Pitfalls to avoid

- Avoid multi-column indexes (and primary keys) unless it is really suitable for the situation
- Avoid too many indexes on a table

1.5.2 Creating the database

grape_tools contains a script called **setup_database** to create a database from a typical setup described above.

```
Usage: setup_database [options] [config_file] | [directory directory directory ...]
```

Options:

-h, --help	output usage information
-r, --recreate	Drop and recreate database (a connection will be opened using the en
-d, --dburi [dburi]	DB connection string (postgresql://user:password@host/dbname)
-s, --superdburi [superdburi]	Super user DB connection string (if not specified, environment varia

If a config.js file is provided to setup_database, SQL files will be loaded in the following order:

1. Grape database files are loaded from `node_modules/ps-grape/db`
 2. Each entry in the [db_definition](#) config option are traversed, and subdirectories named 'schema', 'function', 'view' and 'data' (in that order) are recursively read for SQL files. The 'data' directory is ignored when `--recreate` is not used
 3. Each entry in the [sql_dirs](#) config option are traversed recursively, and SQL files loaded
- If the `-r, --recreate` option is specified, a "CREATE DATABASE" statement will be executed in a separate connection before the other files are loaded.

1.6 Sending Emails

1.6.1 Setup

The following needs to be set up in order to send emails from within SQL functions:

1. `smtp` settings in config

```
smtp: {
  host: 'mail.platsoft.net',
  from: 'Merlot <merlot-live@platsoft.net>',
  secureConnection: true,
  port: 465,
  auth: {
    user: 'username',
    pass: 'password'
  }
}
```

2. `email_template_directory` in config containing templates, typically `__dirname + '/email_templates'`

1.6.2 Send an email from PostgreSQL

Call `grape.send_email(to TEXT, template TEXT, data JSON, headers JSON)` to send an email. The values of the parameters should be as follows:

- `to` Email address of receiver
- `template` Template name (see **Email templates** below)
- `data` Template data
- `headers` Optional - this is an array of additional headers to include in the email. For example: `{'X-Key1': 'value', 'X-Key2': 'value'}`

1.6.3 Send an email through an API call

The API call [GrapeSendMail \(/grape/send_mail\)](#) can be called from a client application to send an email. See [GrapeSendMail](#) for more information.

1.6.4 Custom headers

Commonly used custom headers:

- **From:** Change the From field
- **Reply-To:** Reply To field

1.6.5 Email templates

Email templates live in the `email_template_directory` defined in the app's config. Each template has 4 files (each starting with the specified `templatename`):

- `templatename.subject` - To generate the subject

- **templatename.text** - To generate the plain-text body of the email
- **templatename.html** - To generate the HTML body of the email
- **templatename.attachments** - To generate a list of attachments to include in the email

Underscore's template engine is used. The data sent to **grape.send_email (to, template, data)** is accessible inside the template files. For example, if an email is called with the following data:

```
{ "firstname": "Piet" }
```

The field `firstname` is accessible inside of the templates using `<%= firstname %>`

1.6.6 Example

A typical welcome email will have the following templates (assuming the template name is **welcome**):

welcome.subject:

```
Hi <%= firstname %>! Welcome to <%= product_name %>
```

welcome.text:

```
Hi <%= firstname %>!  
Welcome to <%= product_name %>.  
  
Your login details are as follows:  
Username: <%= username %>  
Password: <%= password %>  
  
Goodbye
```

The HTML file is optional, and follows the same pattern.

This template must be called with a JSON object containing at least fields **firstname**, **product_name**, **username** and **password**. The send this email, call the `grape.send_email` function:

```
SELECT grape.send_email('piet@platsoft.net', 'welcome',  
'{"firstname": "Piet",  
"product_name": "Some System",  
"username": "Piet",  
"password": "Piet123"}'::JSON);
```

1.7 Generating PDF Files

To generate a PDF document in a Grape application, we use [Apache FOP](#). The generation process works as follows:

1. A database function returning XML text is defined
2. An XSL file is created (in `app.config.xsl_directory`) that transforms the output XML of the database function into XSL-FO
3. An API handler for the specific document type is defined, for example `/download/policy_document/:policy_id`
4. The API handler calls `app.get('pdfgenerator').generate_and_stream_xml` to generate and stream the PDF

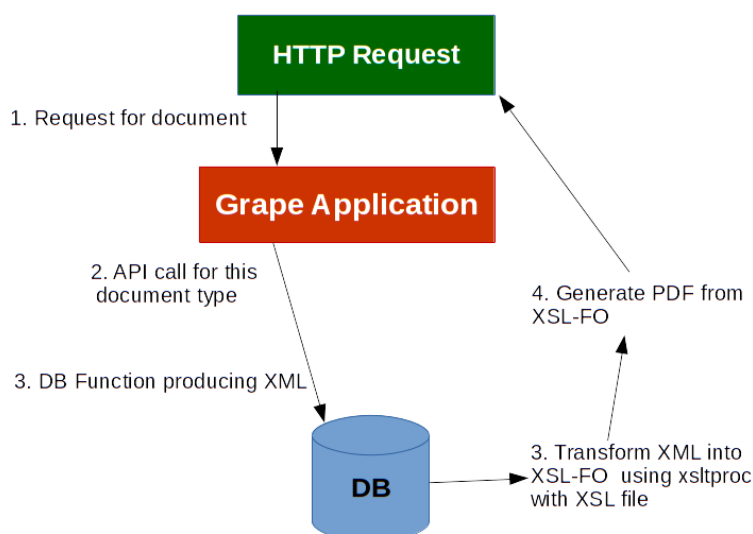


Fig. 3: PDF Generation Process

1.7.1 XML-producing SQL function

A function returning TEXT containing XML.

1.7.2 XSL file

1.7.3 API handler

The API handler will usually make a call to `app.get('pdfgenerator').generate_and_stream_xml(options)`. The options are:

```
{
  res: res, // The HTTP response object
  funcName: 'sql_function', // The SQL function name
  funcParams: [params], // Array of parameters passed to the function
  documentType: 'document_type', // An identifier for this document type. Files will be
    //created in subdirectories with this name
  baseFileName: 'filename', // A filename without any extension, describing this
    //document being created
  xslName: 'xsl_filename', // The XSL file to use for transformation
}
```

Notes:

- The XSL file must be located in the application's [xsl directory](#). If a [site name](#) is configured, an overriding file can be stored in a subdirectory with the same name (as the sitename)
- The function `funcName` must return an XML document

1.8 Grape settings

Grape stores internal settings in the table `grape.setting`. The following functions can be used to read and manipulate these settings:

1. `grape.set_value (name TEXT, value TEXT)` - sets the value of setting **name** to **value**
2. `grape.get_value (name TEXT, default_value TEXT)` - returns the value of the setting **name**, or if it does not exist returns **default_value**
3. `grape.setting (name TEXT, default_value TEXT)` - alias for `grape.get_value (name TEXT, default_value TEXT)`

1.8.1 Known Grape settings

NAME	DESCRIPTION	DEFAULT VALUE
hash_passwords	Indicate whether passwords in <code>grape.user</code> is hashed	false
allow_default_paths	If a path is not found and this setting is true, access will be granted	false
grape_version	Current Grape version	
product_name	Name of the current system	
product_uuid	Unique identifier for the product/system	
product_version	Product version	
data_upload_schema	Default schema for data import tables	grape

NAME	DESCRIPTION	DEFAULT VALUE
disable_passwords	If true, authentication will not check whether the password is correct	false
system_url	URL to access system's frontend	

1.9 Grape config file

The following options are recognized in the config passed to Grape:

NAME	DESCRIPTION	DEFAULT VALUE
dburi	DB connection settings	
guest_dburi	DB connection settings for guest users	
api_directory	Directory (or array of directories) containing API files	
db_definition	Array containing directories with DB definitions. Subdirectories schema, function, view and data will be traversed when recreating a database using the setup_database tool	
sql_dirs	Array containing directories with DB definitions. All subdirectories will be recursively read	
pg_temp_directory	Path to a directory to which both PostgreSQL and the running node process has write access	
port	Port on which the UI will be available	
http_port	If this is set, and HTTPS is enabled (use_https), then a normal HTTP server will listen on this port	
public_directory	Directory containing public files	
public_directories	List of directories containing public files	
debug		true
maxsockets	Controls the maximum number of sockets supported	500
bordeaux_config_file	Path to Bordeaux config file	__dirname + '/bordeaux_config.json'
document_store	Path to document store	
use_https	Enable or disable HTTPS. sslkey and sslcert need to be set up correctly	false
session_management	Enable or disable session management	true
smtp	SMTP settings for GrapeMailer	

NAME	DESCRIPTION	DEFAULT VALUE
server_timeout	The number of milliseconds of inactivity before a socket is presumed to have timed out	50000
sslkey	Path to private SSL key file	__dirname + '/cert/private.pem'
sslcert	Path to private SSL public certificate	__dirname + '/cert/public_nopass.pem'
hr_system	URL to get access to the Bordeaux system running on Savanna HR system	https://192.168.50.86:3999/
email_template_directory	Path to email templates (See GrapeMailer for more information)	__dirname + '/email_templates'
compile_js_dirs	List of directory names that will be recursed when all JS is being compiled	['pages']
site_name	If multiple sites are used (for example different XSL files for documents), specify the site	
xsl_directory	Directory containing XSL files for PDF generation	
fop	Path to the Apache FOP binary (for generation of PDF files)	

1.10 Standardized Error Codes

CODE	DESCRIPTION
-1	Unknown Error
-2	Permission Denied
-3	Invalid Input
-5	Requested data not found
-99	Database Error

1.11 Built-in API calls

1.11.1 GrapeDeleteRecord

Delete a record from a table (the table needs to be whitelisted)

URL: `/grape/delete_record`

Method: POST

SQL Function: [grape.delete_record](#)

Input:

- *JSON object containing the following fields:*
 - **tablename** *STRING* Table name to delete the record from
 - **schema** *STRING* Schema name of table

- *filter* **JSON** Key-value pair of lookup values (the WHERE clause)

Example input:

```
{
  "schema": "public",
  "tablename": "product",
  "filter": {
    "description": "Refining Mist (200ml)"
  }
}
```

Output:

- *JSON object containing the following fields:*
 - *return* **JSON** On success, the returning values (as specified by the input field returning)
 - *status* **ENUM** Status indicator Possible values: **ERROR, OK**
 - *message* **STRING** Error message
 - *code* **NUMBER** Error code
 - *error* **JSON** Error details

1.11.2 GrapeInsertRecord

Inserts a new record into a whitelisted table

URL: /grape/insert_record

Method: POST

SQL Function: [grape.insert_record](#)

Input:

- *JSON object containing the following fields:*
 - *tablename* **STRING** Table name to insert record into
 - *schema* **STRING** Schema name of table
 - *values* **JSON** Key-value pair of values for the new record
 - *returning* **STRING** Column value of new record to return (or * for all)

Example input:

```
{
  "schema": "public",
  "tablename": "product",
  "values": {
    "description": "Refining Mist (200ml)"
  },
  "returning": "*"
}
```

Output:

- *JSON object containing the following fields:*
 - *return* **JSON** On success, the returning values (as specified by the input field returning)
 - *status* **ENUM** Status indicator Possible values: **ERROR, OK**
 - *message* **STRING** Error message
 - *code* **NUMBER** Error code

- **error** **JSON** Error details

1.11.3 GrapeListQuery

List records from a table or view

URL: /grape/list

Method: POST

SQL Function: [grape.list_query](#)

Input:

- **JSON object containing the following fields:**
 - **tablename** **STRING** Table or view name
 - **schema** **STRING** Schema name of table or view
 - **sortfield** **STRING** optional Field to order by
 - **limit** **NUMBER** optional Record limit default 50
 - **offset** **NUMBER** optional Record offset default 0
 - **filter** **ARRAY of objects:**
 - **field** **STRING** Field to filter on
 - **operand** **STRING** One of '=', '>', '<', '>=', '<=', 'LIKE', 'ILIKE'
 - **value** **STRING** Filter value

Example input: Output:

- **JSON object containing the following fields:**
 - **result_count** **NUMBER** Number of results returned
 - **offset** **NUMBER** Result offset
 - **limit** **NUMBER** Results limit
 - **records** Array of returned records **ARRAY of JSON objects**
 - **total** **NUMBER** Total number of records in the database (after filter has been applied)

1.11.4 GrapeSendMail

Sends an email

URL: /grape/send_mail

Method: POST

SQL Function: [grape.send_email](#)

Input:

- **JSON object containing the following fields:**
 - **to** **STRING** Email address of recipient
 - **template** **STRING** Template Name
 - **template_data** **JSON**
 - **headers** **JSON**

Example input: Output:

- **JSON object containing the following fields:**
 - **status** **ENUM** Status indicator Possible values: **ERROR, OK**
 - **message** **STRING** Error message
 - **code** **NUMBER** Error code
 - **error** **JSON**

1.11.5 GrapeUpdateRecord

Updates a record in a table (the table needs to be whitelisted)

URL: /grape/update_record

Method: POST

SQL Function: [grape.update_record](#)

Input:

- *JSON object containing the following fields:*
 - *tablename* **STRING** Name of the table to update
 - *schema* **STRING** Schema name of table
 - *filter* **JSON** Key-value pair of lookup values (the WHERE clause)
 - *values* **JSON** Key-value pair of values for the new data
 - *returning* **STRING** Column value of new record to return (or * for all)

Example input:

```
{
  "schema": "public",
  "tablename": "product",
  "filter": {
    "description": "Refining Mist (200ml)"
  },
  "values": {
    "description": "Refining Mist (250ml)"
  },
  "returning": "*"
}
```

Output:

- *JSON object containing the following fields:*
 - *return* **JSON** On success, the returning values (as specified by the input field returning)
 - *status* **ENUM** Status indicator Possible values: **ERROR, OK**
 - *message* **STRING** Error message
 - *code* **NUMBER** Error code
 - *error* **JSON** Error details

1.11.6 GrapeUserSave

Save a user, or create one if it does not currently exist

URL: /grape/user/save

Method: POST

SQL Function: [grape.user_save](#)

Input:

- *JSON object containing the following fields:*
 - *user_id* **NUMBER** User ID to update
 - *username* **STRING** Username
 - *fullnames* **STRING** Full names
 - *email* **STRING** Email address of user

- `password` **STRING** Password
- `active` **BOOLEAN** Indicate if user is active (can login)
- `role_names` **ARRAY of STRING**
- `employee_guid` **STRING**
- `employee_info` **JSON**

Example input: Output:

- *JSON object containing the following fields:*
 - `status` **ENUM** Possible values: **ERROR, OK**
 - `user_id` **NUMBER** User ID of new user
 - `message` **STRING**
 - `code` **NUMBER**
 - `error` **JSON**

1.11.7 download_public_js_files

The **download_public_js_files** API call is a special API call that will traverse all subdirectories in the public directories (defined by *public_directories*), with the names defined by *compile_js_dirs*. The default values for *compile_js_dirs* is **pages**. This means all subdirectories named "pages" will be traversed for JS files, and served through this call.

1.12 Grape SQL Functions

1.12.1 API result functions

This functions deal with the creation of standardized API results (in JSON format) to be sent back to the API call. They can be found in [api_result_json.sql](#)

NAME	PARAMETERS	DESCRIPTION
api_result_error	<code>message</code> TEXT <code>code</code> INTEGER <code>info</code> JSON	Returns a standardized JSON error object with stats as "ERROR" and the other fields populated. Example: <pre>{"status":"ERROR", "message":"Message", "code": -2, "error": { } }</pre>
api_error	<code>message</code> TEXT <code>code</code> INTEGER <code>info</code> JSON	Overload for api_result_error
api_error		With no arguments, an "Unknown error" message will be generated
api_error_invalid_input		Similar to calling <code>api_result_error("Invalid input", -2)</code>
api_success	<code>keys</code> TEXT[] <code>values</code> TEXT[] <code>types</code> TEXT[]	This function will construct a JSON object containing at least one field, "status" with the value "OK". The 3 input parameters should be arrays containing additional keys, values and the associated types (n/i/number/integer, j/json or nothing for text).
api_success	<code>keys</code> TEXT[] <code>values</code> TEXT[]	
api_success	<code>key</code> TEXT <code>value</code> INTEGER	
api_success	<code>key1</code> TEXT <code>value1</code> INTEGER <code>key2</code> TEXT <code>value2</code> INTEGER	Create an API result success JSON object with two integer fields added.
api_success	<code>key</code> TEXT	Create an API result success JSON object with a JSON field merged into the result.

NAME	PARAMETERS	DESCRIPTION
	<i>value</i> JSON	
api_success		Returns a API result object with a status field set to "OK".

1.12.2 Data importing functions

NAME	PARAMETERS	DESCRIPTION
data_import_insert		
data_upload_done		
data_import_row_insert		

1.12.3 JSON helpers

NAME	PARAMETERS	DESCRIPTION
json2xml	<i>data</i> JSON <i>root</i> TEXT	
json_diff	<i>old</i> JSONB <i>new</i> JSONB	
json_diff	<i>old</i> JSON <i>new</i> JSON	
json_object_diff	<i>old</i> JSONB <i>new</i> JSONB	
json_array_diff	<i>old</i> JSONB <i>new</i> JSONB	
json_to_composite_type_text	<i>target_schema</i> TEXT <i>target_type</i> TEXT <i>data</i> JSON	
json_to_composite_type	<i>target_schema</i> TEXT <i>target_type</i> TEXT <i>data</i> JSON	This function will populate a custom type from a JSON object. Multi-level nested objects are supported.
cast_json_array_to_int_array	JSON data	Provides an implicit cast from JSON to INT[] (cast_json_array_to_int_array.sql). <pre># select cast_json_array_to_int_array('[1,2,3]'::JSON); cast_json_array_to_int_array ----- {1,2,3}</pre>
cast_json_array_to_text_array	JSON data	Provides an implicit cast from JSON to TEXT[] (cast_json_array_to_text_array.sql).

1.12.4 List query

Grape's `list_query` call provides an easy way to retrieve rows from a table. Before the contents of a table can be retrieved this way it needs to be added to a whitelist. This functions can be found in [list_query.sql](#). The built-in API call to access this function is **/grape/list**. Access control is enforced on tables retrieved.

The **grape.list_query** function returns rows from a database table. The following input fields are recognized:

- tablename

- `schema` (optional) TEXT
- `sortfield` (optional) TEXT
- `sortorder` (optional) TEXT DESC
- `limit` (optional) INTEGER default 50
- `offset` (optional) INTEGER default 0
- `filter` (optional) array of fields:
- `field` TEXT
- `operand` TEXT of '=', '#x003E;', '#x003C;', '#x003E;=', '#x003C;=', 'LIKE', 'ILIKE', 'IS_NULL', 'IS_NOT_NULL', 'IN'
- `value` text

The following functions deals with the access control:

NAME	PARAMETERS	DESCRIPTION
<code>grape.list_query_whitelist_add</code>	<code>schema</code> TEXT <code>tables</code> TEXT[] - A list of table names to allow <code>roles</code> TEXT[] - A list of roles to allow	Adds tables to the whitelist for use in <code>grape list_query</code> . Users must be in <code>_roles</code> to be able to access the data in the table.
<code>grape.list_query_whitelist_delete</code>	<code>schema</code> TEXT <code>tablename</code> TEXT - A table to remove from allow	Removes a table from the whitelist.

1.12.5 Table Operations

Grape provides 3 API calls to perform generic DML (INSERT, UPDATE and DELETE) on whitelisted tables.

The API calls are:

- [GrapeInsertRecord](#)
- [GrapeUpdateRecord](#)
- [GrapeDeleteRecord](#)

The SQL function used to whitelist tables, are `grape.table_operation_whitelist_add(schema TEXT, tables TEXT[], roles TEXT[], allowed_operation TEXT)`.

- **`schema`** - The schema of the table
- **`tables`** - An array of table names to add
- **`roles`** - An array of role names to allow
- **`allowed_operation`** - The operation to allow (INSERT, UPDATE or DELETE)

1.12.6 Reports

This functions can be found in `reports.sql`.

NAME	PARAMETERS	DESCRIPTION
<code>save_report</code>	<code>settings</code> JSON	
<code>execute_report</code>	<code>report_id</code> INTEGER <code>parameters</code> JSON	
<code>execute_report</code>	<code>parameters</code> JSON	

1.12.7 User related functions

NAME	PARAMETERS	DESCRIPTION
grape.user_save	JSON containing: <i>user_id</i> INTEGER <i>username</i> TEXT <i>password</i> TEXT <i>email</i> TEXT <i>fullnames</i> TEXT <i>active</i> BOOLEAN optional <i>role_names</i> TEXT[] <i>employee_guid</i> GUID	Save a user field, or create a new user. API call: POST /grape/user/save
grape.username	<i>user_id</i> INTEGER	Returns the username for a user ID, or NULL if it does not exist.
grape.user_id_from_name	<i>username</i> TEXT	Returns the user ID for a username, or NULL if it does not exist.
grape.user_id_from_fullnames	<i>fullnames</i> TEXT	Returns the user ID for a user found by fullnames, or NULL if it does not exist.
grape.username_from_fullnames	<i>fullnames</i> TEXT	Returns the username for a user found by fullnames, or NULL if it does not exist.
grape.hash_user_password	<i>user_id</i> INTEGER	Hashes a password for user and updates the user table afterwards. <ul style="list-style-type: none"> If the hash length is the same as the password length and the password starts with a '\$' sign, it is assumed that the password is already hashed and the update is ignored (return -1) If grape.setting passwords_hashed isn't true, nothing is done (return -2) On success 0 is returned
grape.hash_user_password	<i>username</i> TEXT	Overload for <i>grape.hash_user_password (user_id INTEGER)</i>

1.12.8 Session related functions

NAME	PARAMETERS	DESCRIPTION
grape.current_user_roles		Returns a list of all roles the current user belongs to.
grape.current_user_id		Returns the integer value of the current session's "grape.user_id" setting. This is typically set with grape before any API call is called
grape.check_session_access	<i>session_id</i> TEXT - Session ID to check for <i>check_path</i> TEXT - Access path to check <i>check_method</i> TEXT - HTTP method to check (GET/POST)	This function performs access control on an API call (based on the path and session ID). It is automatically called by the express app before any API call is performed: <ol style="list-style-type: none"> Check that the path has access control on it. If it cannot be found, the grape setting default_access_allowed is checked, and if true, access will be granted. If not, it will be denied and code 9 will be returned If the path has a role 'guest' granted access to it, everyone will be allowed (even if the session is invalid) If the session is invalid, access will be denied and code 1 returned If the path has a role 'all', only, and all, valid sessions will be granted access If the user has access granted to the access path's role, access is granted If all the above fails, access is denied with code 2
grape.session_insert		
grape.logout	JSON JSON containing session_id	API call /grape/logout
grape.session_ping	JSON JSON containing session_id	Checks validity of a session and returns a JSON object containing the session's username, user_id, fullnames, email, GUID and user_roles. API Call /grape/session_ping

NAME	PARAMETERS	DESCRIPTION
grape.session_insert	<i>username</i> TEXT <i>password</i> TEXT	This function inserts a new session for a valid username and password provided. API call <i>/grape/logout</i>
grape.		
grape.		

1.12.9 Other utility functions

NAME	PARAMETERS	DESCRIPTION
month_diff	<i>_d1</i> DATE <i>_d2</i> DATE	Returns an integer containing the number of months between the two dates provided. If the first parameter is after the second (higher date), the return value will be negative.
set_value	<i>_name</i> TEXT <i>_value</i> TEXT	Sets the value (insert if new, replace if exist) in the key-value pair table <code>grape.setting</code> returning <i>_value</i> .
get_value	<i>_name</i> TEXT <i>_default_value</i> TEXT	Gets the value for setting <i>_name</i> , and if not found it will return <i>_default_value</i> . Defined in setting.sql
generate_uuid		Generates a unique UUID (for example b1086d35-e973-4356-3adc-2eeb6f4963e2). Defined in uuid.sql
array_lowercase	TEXT[]	
clean_telephone_number	<i>_tel</i> TEXT	
random_string	<i>length</i> INTEGER	Generates a random string of <i>length</i> length. Defined in random_string.sql