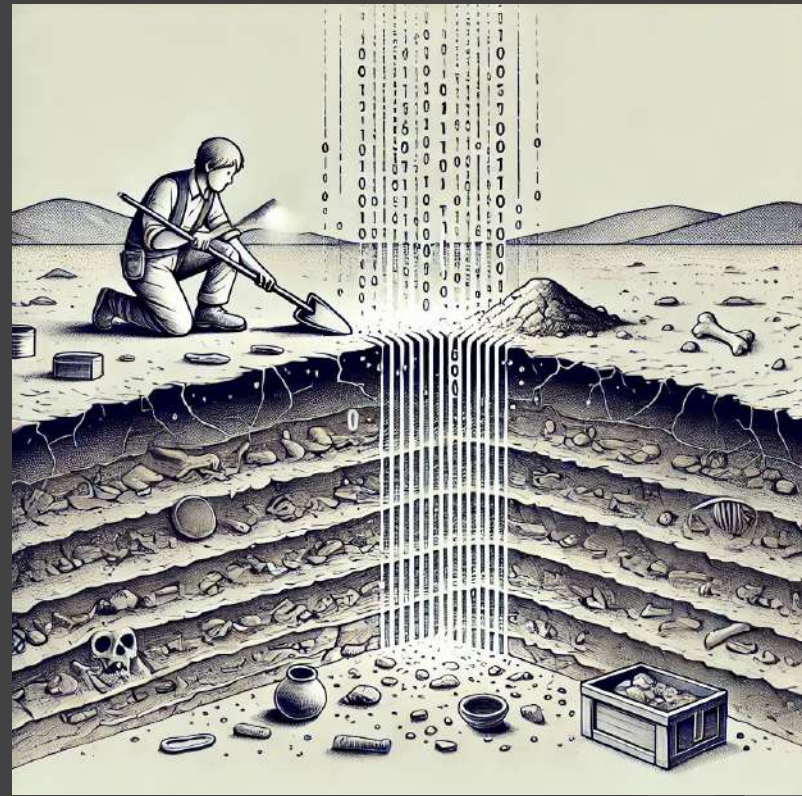


Unearthing the Past with PostgreSQL: How Open Source is Revolutionizing Digital Archaeology

Ophir Lojkin & Thomas Guillemard



Générée par Dall-e

Archeological data needs

What data do archaeologists work with ?

Building a web app in SQL

Quickly building web interfaces on top of a database, with SQLPage

Badmobil

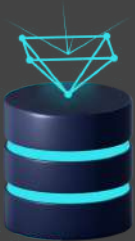
The archaeological multi-tool, to collect and analyze on-site data



Ophir LOJKINE

Inthy (renewable mobility actor)

Long-time Open-Source Software contributor
sql.js, WBO whiteboard, dezoomify, **SQLPage**



SQLPage

Turns SQL queries into web pages and web applications

Builds UIs on top of databases

Open source tool (github.com/sqlpage)



Thomas Guillemard

Institut national de recherches archéologiques préventives (Inrap)

Archaeological Operations Manager

Geographic Information System (**GIS**) Coordinator & Trainer



RAMEN collective

Recherches Archéologiques en Modélisation de l'Enregistrement Numérique

Research and Development (Database, GIS)

Archaeology produces A LOT of data



Two main type of archaeology in France

Programmed archaeology

- On selected sites
- Specific research questions
- Associations, CNRS, University

excavation/training | studies



Preventive archaeology

- Before construction projects
- Evaluation of archaeological potential
- Diagnostics and excavations

excavation | studies

EXCAVATING = DESTRUCTION

Archaeology on paper

A LOT OF DATA...

- Everything that archaeologist **finds** is recorded
- Everything that archaeologist **does** is recorded
- Many specialists with **different methods**



Archaeology and the beginning of digitization

More a clean-up than a recording...

Listing
on
paper

Listing
on
computer

Form
on
paper

Digital
form

Drawing
on paper

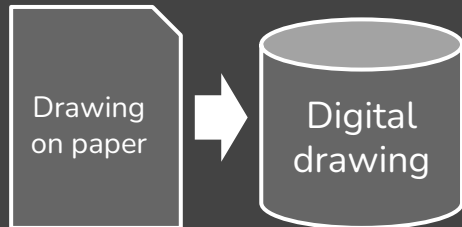
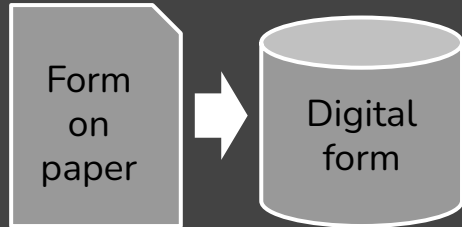
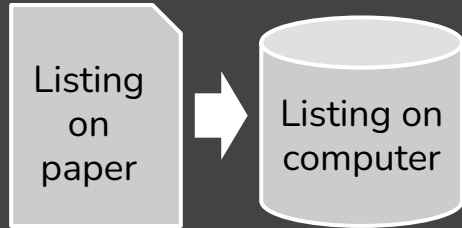
Digital
drawing

n° photo	ST fait concerné	Observations	date auteur
602 604	Ambrance		01/10/24
605 608	604 - fosse 5015 surcreusé!		//
602 605 602 606	Photogramm F5302 (cremation)	Photogramm	01/10/24
602 608 602 609	F. 5302 (1 ^{re} moitié)	Plan, coupe, détail	01/10/24
602 611	//	//	02/10/24
602 612	//	(matériau éminé)	HBC
602 613	//	//	HBC
602 614	photogram 5301		07/10/24
602 615			04
602 616	plan/coupe F5303		09/10/24
602 617	détail de la fosse		B.R.
602 618	photogram 5301		01/10/24
602 619	plan/coupe F5301		01/10/24
602 620	5301 plan coupe		01/10/24
602 621			HBC

A	B	C	D	E
n° photo	description	date	auteur	observations
2	602 ambience	01/10/24		
3	603 ambience	01/10/24		
4	604 ambience	01/10/24		
5	605 Sd. ? - F8075 (fossé)	01/10/24		Fossé surcreusé
6	606 Sd. ? - F8075 (fossé)	01/10/24		Fossé surcreusé
7	607 Sd. ? - F8075 (fossé)	01/10/24		Fossé surcreusé
8	608 Sd. ? - F8075 (fossé)	01/10/24		Fossé surcreusé
9	609 F5301 (crémation)	01/10/24 GB		photogrammétrie
10	610 F5301 (crémation)	01/10/24 GB		photogrammétrie
11	611 F5301 (crémation)	01/10/24 GB		photogrammétrie
12	612 F5301 (crémation)	01/10/24 GB		photogrammétrie
13	613 F5301 (crémation)	01/10/24 GB		photogrammétrie
14	614 F5301 (crémation)	01/10/24 GB		photogrammétrie
15	615 F5301 (crémation)	01/10/24 GB		photogrammétrie
16	616 F5301 (crémation)	01/10/24 GB		photogrammétrie
17	617 F5301 (crémation)	01/10/24 GB		photogrammétrie
18	618 F5301 (crémation)	01/10/24 GB		photogrammétrie
19	619 F5301 (crémation)	01/10/24 GB		photogrammétrie
20	620 F5301 (crémation)	01/10/24 GB		photogrammétrie
21	621 F5301 (crémation)	01/10/24 GB		photogrammétrie
22	622 F5301 (crémation)	01/10/24 GB		photogrammétrie
23	623 F5301 (crémation)	01/10/24 GB		photogrammétrie
24	624 F5301 (crémation)	01/10/24 GB		photogrammétrie
25	625 F5301 (crémation)	01/10/24 GB		photogrammétrie
26	626 Plan, coupe et détail de la première moitié de la crémation F5301	01/10/24 HBC		plan, coupe, détail
27	627 Plan, coupe et détail de la première moitié de la crémation F5302	01/10/24 HBC		plan, coupe, détail
28	628 Plan, coupe et détail de la première moitié de la crémation F5303	01/10/24 HBC		plan, coupe, détail
29	629 Plan, coupe et détail de la première moitié de la crémation F5304	01/10/24 HBC		plan, coupe, détail
30	630 Plan, coupe et détail de la première moitié de la crémation F5305	01/10/24 HBC		plan, coupe, détail
31	631 Plan, coupe et détail de la première moitié de la crémation F5306	01/10/24 HBC		plan, coupe, détail
32	632 Plan, coupe et détail de la première moitié de la crémation F5307	01/10/24 HBC		plan, coupe, détail
33	633 Plan, coupe et détail de la première moitié de la crémation F5308	01/10/24 HBC		plan, coupe, détail

Archaeology and the beginning of digitization

More a clean-up than a recording...



1 SIG 1 : découverte et exploitation des SIG à l'éc

2 SIG 2 : Les figures du rapport avec QGIS

3.1 SIG 3.1 : Bases de Données spatiale et attributaire

3.2 SIG 3.2: Analyses Spatiales

...Until

La Nécropole Numérique / The Digital Necropolis

The Mastraits necropolis at Noisy-le-Grand



Pascal Raymond - Inrap 2024



a medieval necropolis
programmed archaeology
near to Paris

No paper / all digital





The Badass project



the data - a Postgresql / Postgis database



Structuring principle

The screenshot displays a PostgreSQL database interface. On the left, the 'Object Explorer' shows the database structure for 'badass Ophir', including 'Bases de données (2)', 'badass', 'Catalogues', 'Extensions', 'Langages', 'Publications', 'Schémas (2)', and 'necronum_v2'. The 'necronum_v2' schema contains various objects like 'Analyseurs de...', 'Collationnemer...', 'Configurations', 'Dictionnaires d...', 'Domaines', 'Fonctions', 'Fonctions d'agr...', 'Fonctions décl...', 'Modèle de rect...', 'Opérateurs', 'Procédures', 'Séquences', and 'Tables (64)'. The 'Tables (64)' folder is expanded, showing tables like 'axe', 'catalogue.tr...', 'coupe_axe', 'coupe_line', 'coupe_poly', 'emprise', and 'I enuine'.

The main window shows a query editor with the following SQL query:

```
1 SELECT * FROM necronum_v2.t_fait
2 ORDER BY id_fait ASC
```

The 'Data Output' tab displays the results of the query in a table format:

id_fait [PK] integer	numfait integer	interpret character varying (255)	interpret_alter character varying (255)	douteux integer	equiv_diag character varying (255)	statut character va
868	883	968	sépulture	[null]	[null]	[null]
869	884	969	sépulture	[null]	[null]	en cours
870	885	970	sépulture	[null]	[null]	[null]
871	886	971	sépulture	[null]	[null]	[null]
872	887	972	sépulture	[null]	[null]	fouillé
873	888	973	sépulture	[null]	[null]	[null]
874	889	974	sépulture	[null]	[null]	[null]
875	890	975	sépulture	[null]	[null]	fouillé
876	891	976	sépulture	[null]	[null]	[null]
877	892	977	tranchée	[null]	[null]	fouillé
878	893	978	sépulture	[null]	[null]	[null]
879	894	979	sépulture	[null]	[null]	fouillé
880	895	980	sépulture	[null]	[null]	[null]

The status bar at the bottom indicates 'Total de lignes: 922 sur 922' and 'Requête terminée 00:00:53.806'. The current page is 'Lgn 1, Col 1'.



The Badass project



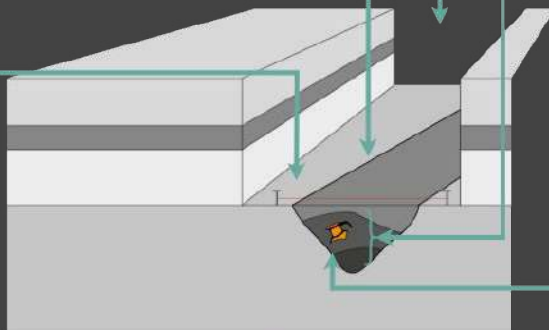
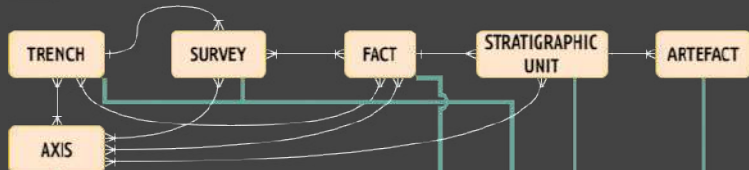
the data - a Postgresql / Postgis database



Structuring principle



Archaeologist describes (ATTRIBUTES) :



Archaeologist draws (SPATIAL) :



Topographic survey (SPATIAL) :

STRATIGRAPHIC SECTION

AREA

POINT

OPENING

AXIS

POLY

LOG



TRIGGERS

ATTRIBUTES
+
SPATIAL
=
INTEGRITY
OF DATA



The Badass project



the user interface - QGIS
a free and open source software

an add-on -
Anthropology
“Badass of the dead”

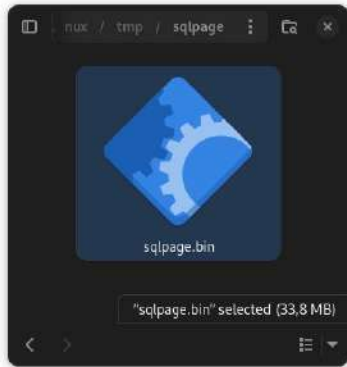
SQLPage: SQL to web pages

Turning SQL queries into web apps, fast.



Building a web app, without web dev

What ?



A single server executable that runs on your desktop or your server.

For whom ?



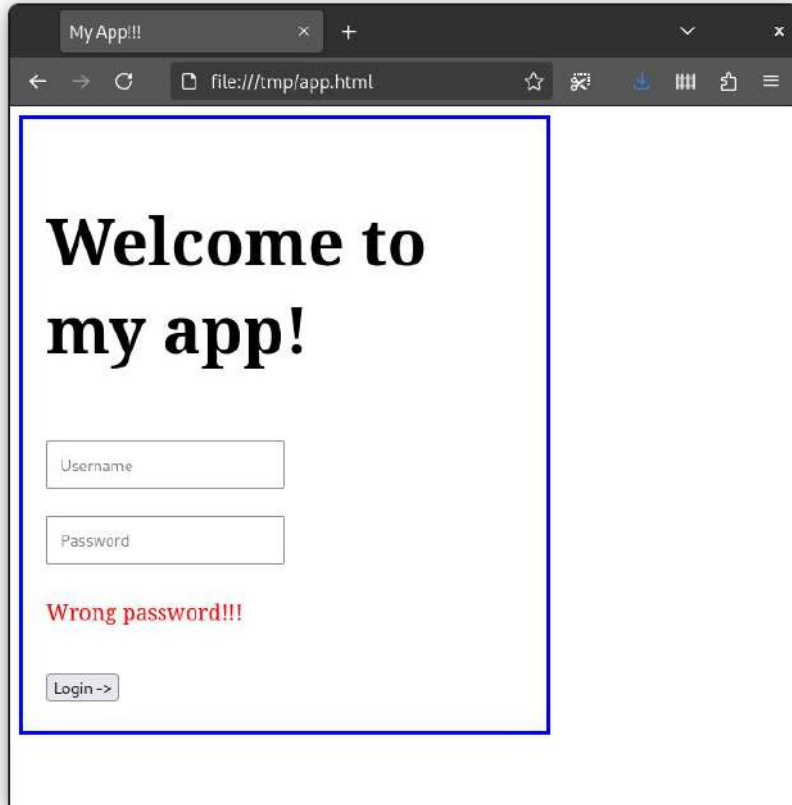
Those who need an app today, and are not JavaScript framework wizards.

How ?



Write a .sql file, connect your database, and you have a website.

Internal pages do not have to be ugly in 2024

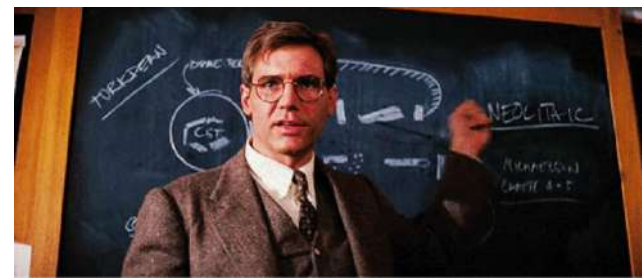




Let's build together



Prof. Jones : Archaeology is the search for fact... not truth...

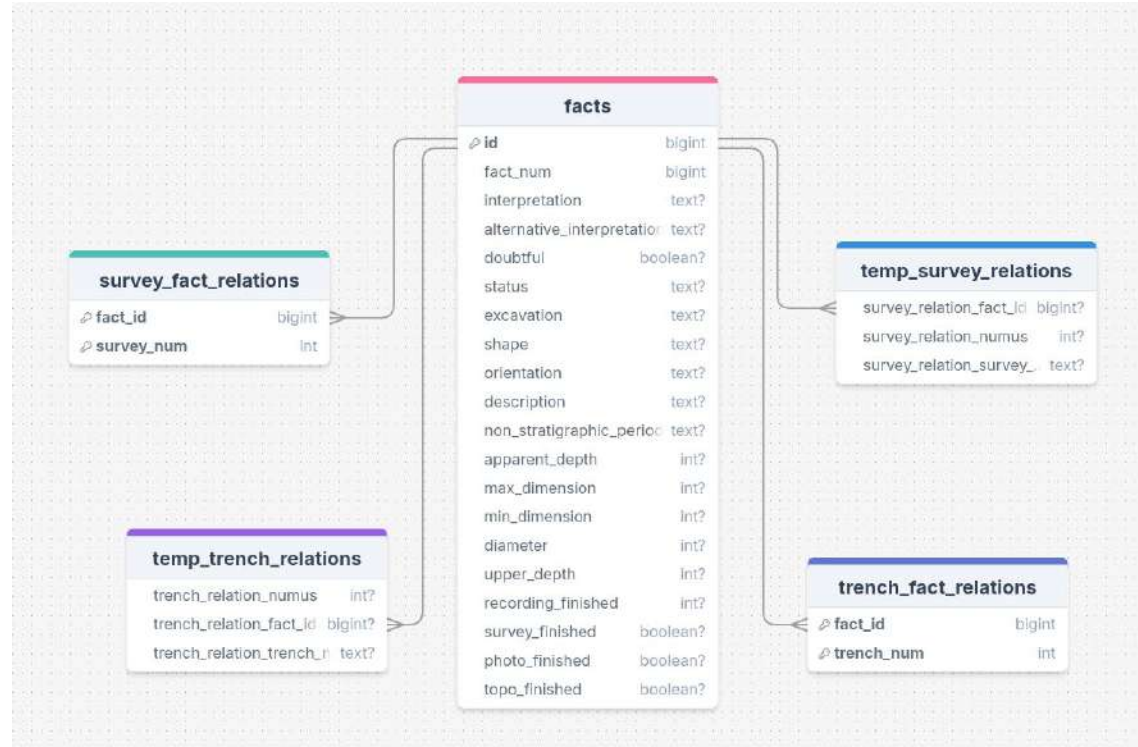


Database schema

Very Simplified Version

Just the *facts*.

What is a fact ?



Listing

Select a component, then select data to populate it.



```
SELECT 'list' as component;  
  
SELECT  
    interpretation as title,  
    description  
FROM facts;
```

The screenshot shows a web browser window with the title 'SQLPage' and the address bar displaying 'localhost:8080'. The page content is a list of archaeological findings, each with a title and a description. The items are:

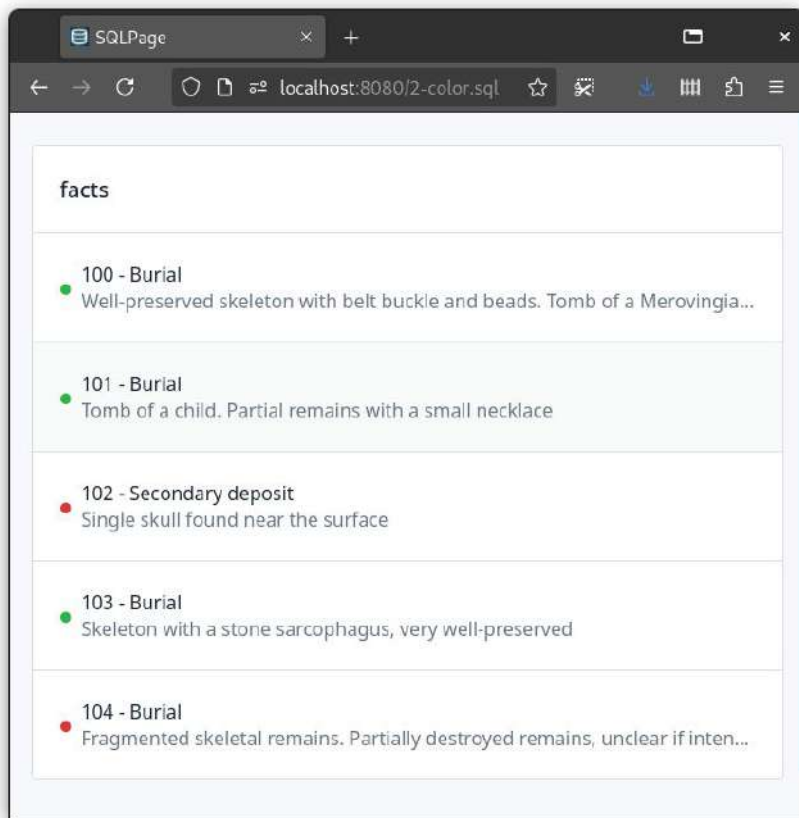
- Burial**: Well-preserved skeleton with belt buckle and beads. Tomb of a Merovingian...
- Burial**: Tomb of a child. Partial remains with a small necklace
- Secondary deposit**: Single skull found near the surface
- Burial**: Skeleton with a stone sarcophagus, very well-preserved
- Burial**: Fragmented skeletal remains. Partially destroyed remains, unclear if intentio...

At the bottom of the page, it says 'Built with [SQLPage](#)'.

Composite attributes

```
SELECT 'list' as component,  
       'facts' as title;  
  
SELECT  
  fact_num || ' - ' || interpretation as title,  
  description,  
  case  
    when doubtful then  
      'red'  
    else  
      'green'  
  end as color  
FROM facts;
```

Top-level and row-level parameters



The screenshot shows a web browser window with the URL localhost:8080/2-color.sql. The browser displays a table titled 'facts' with five rows. Each row has a colored dot next to the title: green for '100 - Burial', '101 - Burial', and '103 - Burial'; and red for '102 - Secondary deposit' and '104 - Burial'. The descriptions are truncated.

facts
100 - Burial Well-preserved skeleton with belt buckle and beads. Tomb of a Merovingia...
101 - Burial Tomb of a child. Partial remains with a small necklace
102 - Secondary deposit Single skull found near the surface
103 - Burial Skeleton with a stone sarcophagus, very well-preserved
104 - Burial Fragmented skeletal remains. Partially destroyed remains, unclear if inten...

SQLPage pseudo-functions

```
SELECT 'list' as component,  
       'facts' as title;  
  
SELECT  
  interpretation as title,  
  description,  
  sqlpage.link(  
    'fact.sql',  
    json_build_object('id', id)  
  ) as link  
FROM facts;
```

SQLPage

localhost:8080/3-link.sql

facts

Burial
Well-preserved skeleton with belt buckle and beads. Tomb of a Merovingian...

Burial
Tomb of a child. Partial remains with a small necklace

Secondary deposit
Single skull found near the surface

Burial
Skeleton with a stone sarcophagus, very well-preserved

Burial
Fragmented skeletal remains. Partially destroyed remains, unclear if intenti...

localhost:8080/fact.sql?id=3

Building the fact page

```
select 'datagrid' as component;

with fact as (
  select * from facts where id = $id::int
)
select 'Fact' as title,
       format('%s - %s', fact_num, interpretation) as description
from fact

union all

select 'Description', description from fact

union all

select 'Status', status from fact;
```

/fact.sql?id=42

FACT
100 - Burial

DESCRIPTION
Well-preserved skeleton with
belt buckle and beads. Tomb of
a Merovingian adult male

STATUS
In progress

Built with [SQLPage](#)

\$id



Building a form

```
SELECT 'form' as component,  
       'process_new_fact.sql' as action;  
  
SELECT 'text' as type, 'Interpretation' as name;  
  
SELECT 'select' as type, 'status' as name, json_build_array(  
  json_build_object('label', 'In progress', 'value', 'inprogress'),  
  json_build_object('label', 'Complete', 'value', 'complete')  
) as options;
```

SQLPage

localhost:8080/4-form.sql

Interpretation

status

In progress

Submit Query

Built with [SQLPage](#)



Building a form



Insert into

```
facts(interpretation, status)
```

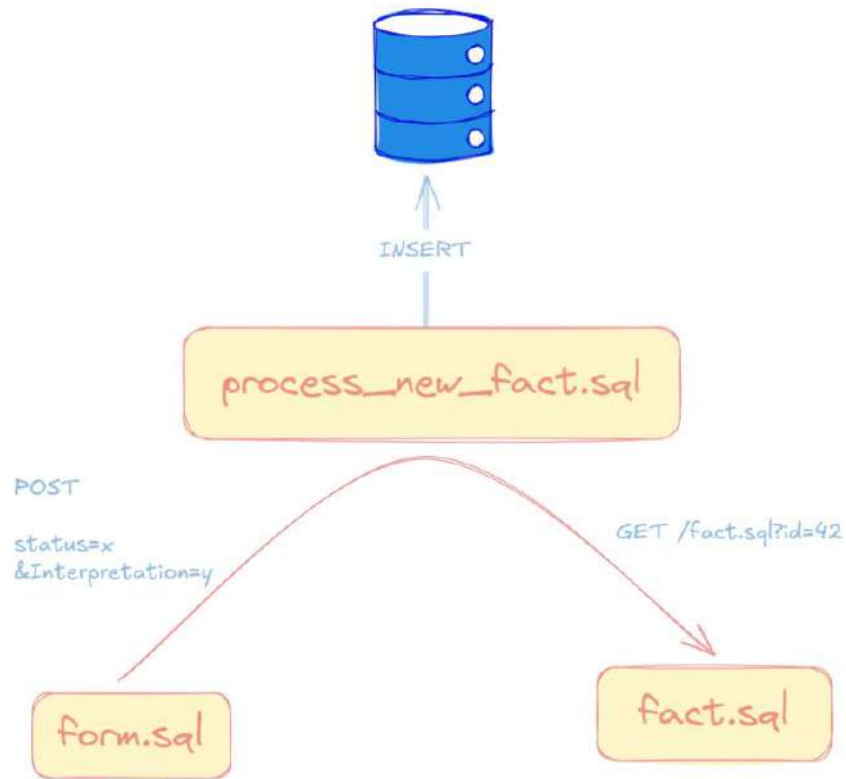
values

```
(:Interpretation, :status)
```

returning

```
'redirect' as component,
```

```
'fact.sql?id=' || id as link;
```



35 components

... and growing are built into SQLPage

+

Build your own components with just an HTML template

Card

152 sales today



13 new users



2 complaints



1 pending support request



Embedded Chart

Syracuse Sequence



You can find the sql file that generates the chart here

Embedded Video



Lynx

The lynx is a medium-sized wild cat native to Northern, Central and Eastern Europe to Central Asia and Siberia, the Tibetan Plateau and the Himalayas.

Tracking

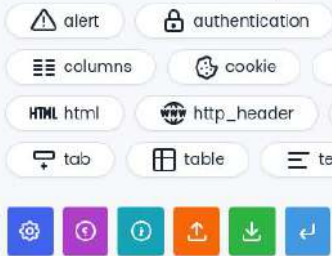
SERVERS STATUS

60% are running

Status of all currently running servers



Button

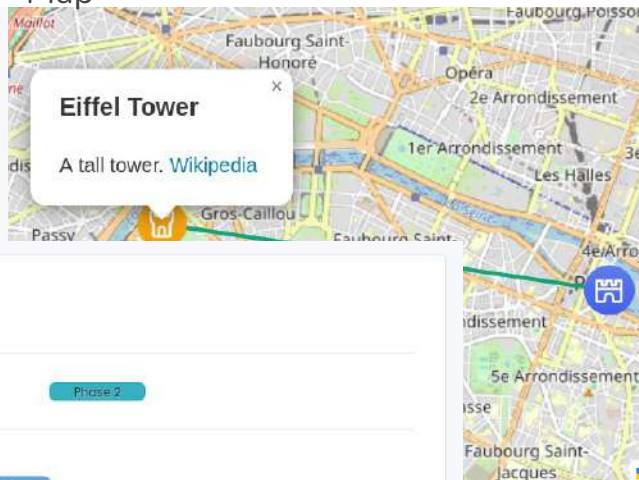


Chart

Quarterly Revenue



Map



Timeline



Project Timeline



And many more...

alert, authentication, big_number, breadcrumb, carousel, columns, cookie, csv, debug, dynamic, foldable, html, http_header, json, redirect, shell, tab, table..

24 functions

Going from simple formatting, to API calling and script execution

SQLPage functions



basic_auth_password



basic_auth_username



cookie



current_working_directory



environment_variable



exec



fetch



hash_password



header



link



path



persist_uploaded_file



protocol



random_string



read_file_as_data_url



read_file_as_text



request_method



run_sql



uploaded_file_mime_type



uploaded_file_name



uploaded_file_path



url_encode



variables



version



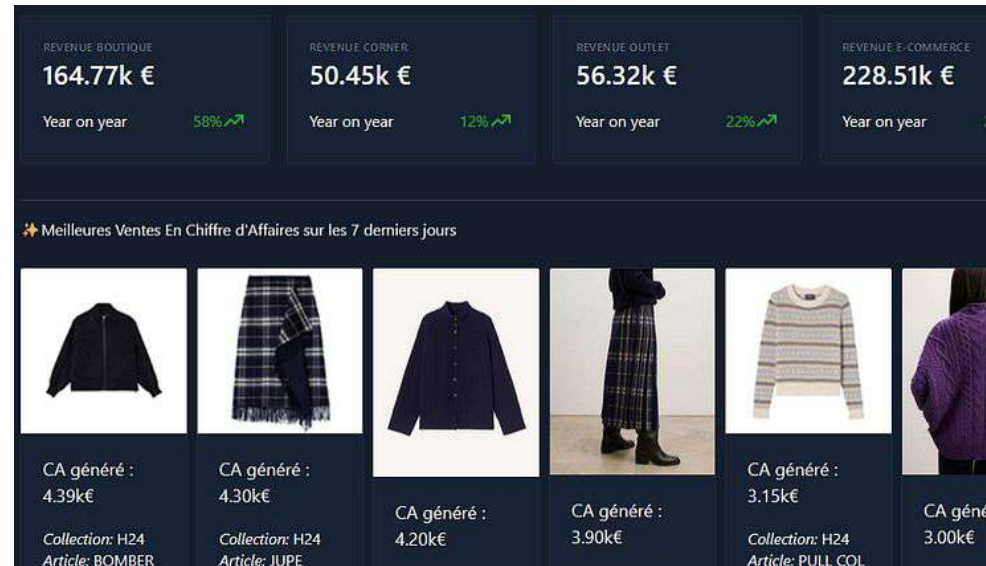
How does it work ?





What's inside ?

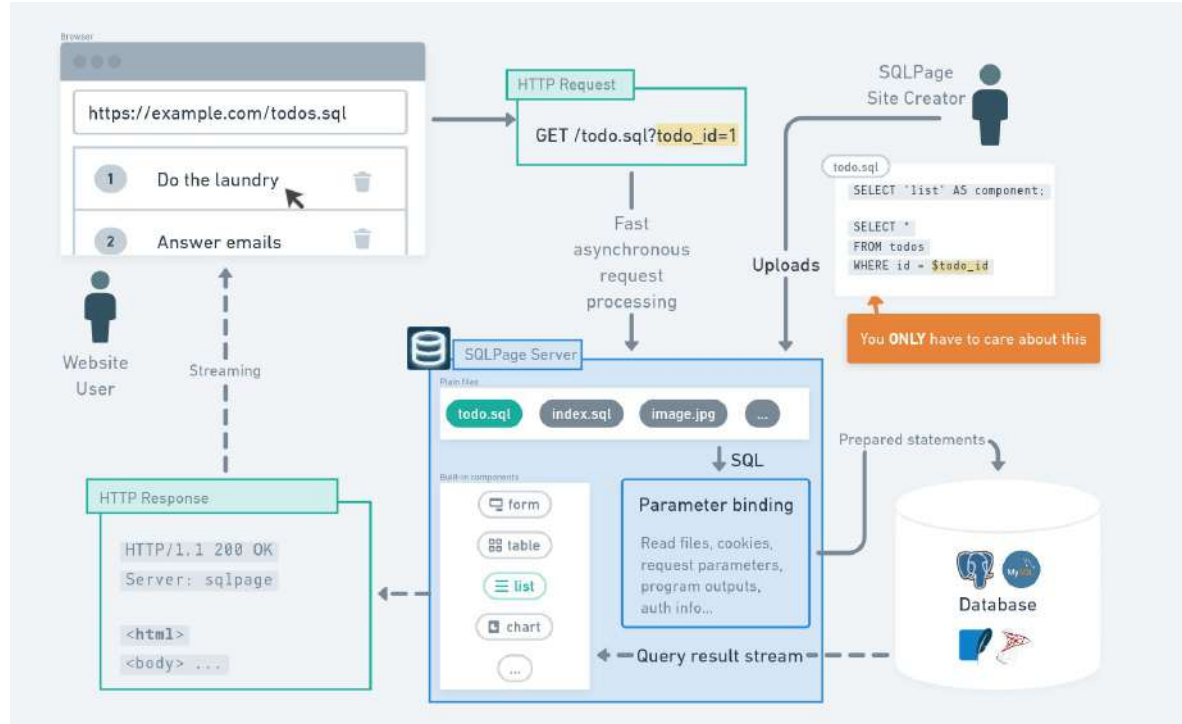
- A web server (http, ssl, http2)
- Database drivers (pg, mysql, sqlite, mssql)
- A sql parser (to dynamically bind http query parameters and sqlpage function results)
- A large set of components (pre-built handlebars templates)
- A CSS library (tabler.io)





How it works

- Get a request
- Find the SQL file
- Parse it
- Bind request parameters where needed
- Pass it to the db.
- Identify the component in the db response.
- Load the HTML template
- Fill the template with rows
- Stream the HTML back






Badmobil










```
SELECT
  'list' as component;
SELECT
  'FAIT' AS title,
  'fait/faits.sql' AS link,
  'green' as color,
  '**||(SELECT count(numfait) from t_fait)||** fait(s) enregistré(s)'
  as description_md,
  'layers-union' as icon;
SELECT
  'US' AS title,
  'us/us.sql' AS link,
  'green' as color,
  '**||(SELECT count(numus) from t_us)||** US enregistr e(s)'
  as description_md,
  'squares' as icon;

-- Requete qui d termine si la partie anthropo s'affiche dans
l'accueil en fonction de la pr sence de l'extension DeathNote
SELECT
  'Anthropo. DeathNote v0.1.0' as title,
  'of_the_dead/anthropo_liste.sql' as link,
  'pink' as color,
  'grave-2' as icon,
  '**||(SELECT count(numus) from t_us where interpret IN('d p t primaire inhumation', 'd p t non primaire inhumation'))
  || ** squelette(s) et ' ||**||(SELECT count(numus) from t_us where interpret like 'contenant inhumation')
  || ** contenant(s) enregistr e(s)' as description_md
FROM sqlite_master
WHERE
  type='table' AND name='t_squelette';
```

 BAD'MOBIL v1.6.0 - 

 SUIVI du TERRAIN

-  Tranch e
0 tranch e(s) enregistr e(s)
-  Sondage
0 sondage(s) enregistr e(s)
-  FAIT
922 fait(s) enregistr e(s)
-  US
2965 US enregistr e(s)
-  Anthropo: DeathNote v0.1.0
1030 squelette(s) et 245 contenant(s) enregistr e(s)
-  Isolats
1373 iso(s) enregistr e(s)
-  Ensemble
0 ensemble(s) enregistr e(s)

Badmobil



```
SELECT
'table' AS component,
'Liste des Squelettes et Contenants' as title,
'icon' as icon,
'US' as markdown,
'Saisir' as markdown,
1 as small,
1 as sort,
1 as search;

SELECT
icon, US, Fait, Age, Classe, "Pratique fun.", Saisir
FROM (
SELECT
(CASE
WHEN u.interpret like 'dépôt primaire inhumation' THEN 'man'
WHEN u.interpret like 'dépôt non primaire inhumation' THEN 'dog-bowl'
END) as icon,
['||s.sq_numus||'](s.squelette/modif_squelette.sql?s_q_numus='||s.sq_numus||') AS US,
'F.'||f.numfait as Fait,
s.age_terrain as Age,
s.age_class as Classe,
s.res_pratq_fun as 'Pratique fun.',
'[Taphonomie](s.squelette/observ_sep_list.sql?s_q_numus='||s.sq_numus||')' AS Saisir
FROM t_squelette as s
JOIN t_us as u on u.numus = s.sq_numus
LEFT JOIN t_fait as f on u.numfait = f.numfait
GROUP BY s.sq_numus

UNION
SELECT
'coffin' as icon,
['||u.numus||'](../us/modif_us.sql?numus='||u.numus||') AS US,
'F.'||u.numfait as Fait,
 '-' as Age,
 '-' as Classe,
 '-' as 'Pratique fun.',
'[Observation](s.squelette/observ_cont_list.sql?cont_numus='||u.numus||')' AS Saisir
FROM t_us as u
WHERE u.interpret LIKE 'contenant inhumation'
)
ORDER BY US.
```

ICON	US	FAIT	AGE	CLASSE	PRATIQUE FUN.	SAISIR
	198	F.81	-	-	-	Observation
	199	F.81	adulte	adulte		Taphonomie
	202	F.81	adulte	adulte		Taphonomie
	7008	F.811	adulte	adulte	sarcophage	Taphonomie
	7009	F.811				Taphonomie
	7010	F.811	-	-	-	Observation
	7012	F.812	adulte	adulte	sarcophage	Taphonomie
	7015	F.813	immature	10 à 14 ans	sarcophage	Taphonomie
	7017	F.813	-	-	-	Observation
	7019	F.814	adulte	adulte	sarcophage	Taphonomie
	7021	F.814	-	-	-	Observation
	7023	F.815	adulte	adulte	sans contenant	Taphonomie
	7026	F.816	adulte	adulte	sans contenant	Taphonomie
	7028	F.813	immature		sarcophage	Taphonomie
	7030	F.817	adulte	adulte	sans contenant	Taphonomie
	7033	F.818	adulte	adulte	sans contenant	Taphonomie



One form per archaeological fact

- description
- dimensions
- treatment progress
- the stratigraphic units of which it is composed
- photographs and photogrammetric models
- the geometry of the fact

BAD'MOBIL v1.6.0 - FAIT

Modification du fait F.811

Fait: 811

Interprétation: sépulture

ou:

douteux

Statut:

Etat de fouille:

Forme:

Orientation:

Description:

Datation:

Prof. d'appention:

ATTENTION : utiliser le point "." pour le séparateur de décimal

Long. (m):

ATTENTION : utiliser le point "." pour le séparateur de décimal

Larg. (m):

ATTENTION : utiliser le point "." pour le séparateur de décimal

Diamètre (m):

ATTENTION : utiliser le point "." pour le séparateur de décimal

Prof. conservée (m):

ATTENTION : utiliser le point "." pour le séparateur de décimal

Entr. fini

Relevé fini

Photo fini

Topo fini

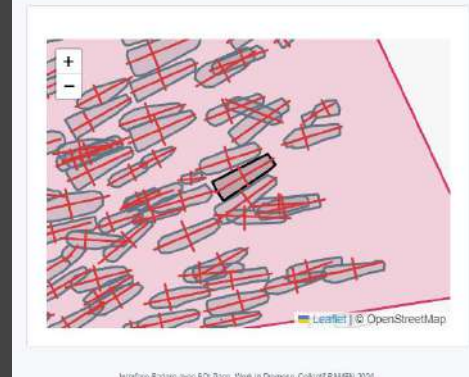
Enregistrer les modifications

Search:

US	US POST	US ANTÉ.	US ÉGAL.	US ÉQUIV.	US SYNCH.	INTERPRÉT.	DESCRIPTION
7010	7009	7005				contenant inhumation	
7005	7008	7010				dépôt non primaire inhumation	
7006	7007	7009				dépôt primaire inhumation	dépôt du corps
7007	7008					comblement	comblement de la sépulture, limon sableux meuble, homogène et brun
7005	7010					creusement	creusement de la fosse sépulcrale SUR TN

Search:

ICON	DOC.	DESCRIPTION
	Photo 1	
	Photo 2	
	Photo 3	
	Photo 149	
	Photo 150	
	Photo 171	
	Photo 172	
	Modèle M007	
	Modèle M008	
	Modèle M038	




With a map component, you can display all the other facts. Clicking on a geometry takes you to the form for another fact



Changes for archaeologists using Badass and Badmobil

- *descriptive data and spatial data in the same place, immediate spatialization of data*
- *standardisation of data recording*
- *multi-user*
- *on various terminals*
- *immediate recording of the data*
- *fewer writing errors*
- *filtering and searching data easily*
- *user friendly*
- *use in the field and during the study*
- *the archaeologist becomes increasingly badass...*

 BAD'MOBIL v1.6.0 - 1010935, Nécropole des Mastraits, No ☰

Session

Utilisateur


Mot de passe

Lancer la session Effacer

IMPORTANT

"Utilisateur" et "mot de passe" doivent être administrés au sein de la table **L_equipe** dans **Badass**

Il est fortement conseillé d'intégrer l'**emprise prescrite** dans la table **emprise** de **Badass** pour retrouver les informations administratives.



Screenpresso.com

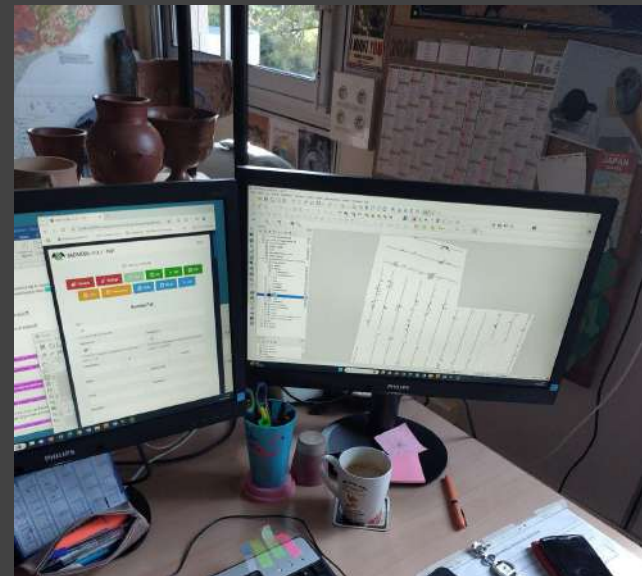
Ever since Badass, SQLpage and Badmobil...

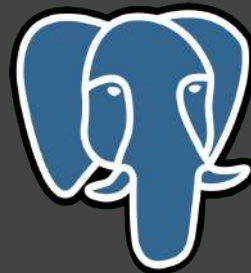
...new ways of working



Ever since Badass, SQLpage and Badmobil...

...new ways of working





Thank You !

Inrap website
<https://www.inrap.fr/>

“Archéologie Des Nécropoles” association
<https://archeonec.hypotheses.org/>

En français
<https://linuxfr.org/news/comment-l-archeologie-entre-progressivement-dans-l-ere-du-logiciel-libre>

SQLPage
<https://sql.datapage.app/>

BADASS Wiki
<https://gitlab.com/projet-r-d-bddsarchoo/tutos/-/wikis/home>

Talk Feedback



Try SQLPage

