OFFLINE VIEWING AND EDITING SPATIAL DATA FOR FOREST FIRE DEFENSE

Feedback on the GeoPoppy solution

MICHAËL DOUCHIN - 3LIZ

CONTEXT

STAKEHOLDERS, DATA, SOFTWARES

STAKEHOLDERS

- **Valabre**: french public institution
- **Help and support actors**: prevent and fight natural risks (fire, flood, etc.)
- **Actions**: test new technologies, research, trainings, share services, tools and data.
- **Partners**: cooperation between several organizations in the French Mediterranean areas.

VALABRE

ANTICIPER VOTRE PRÉSENT

ENTENTE de Valabre

La prévention et la lutte face aux risques naturels majeurs sont les axes stratégiques de l'établissement public.

Désormais forte de 31 collectivités, l'Entente réunit 15 départements, 15 services départementaux d'incendies ainsi que la Collectivité de Corse

Contact

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Conservatoire de la Forêt Méditerranéenne

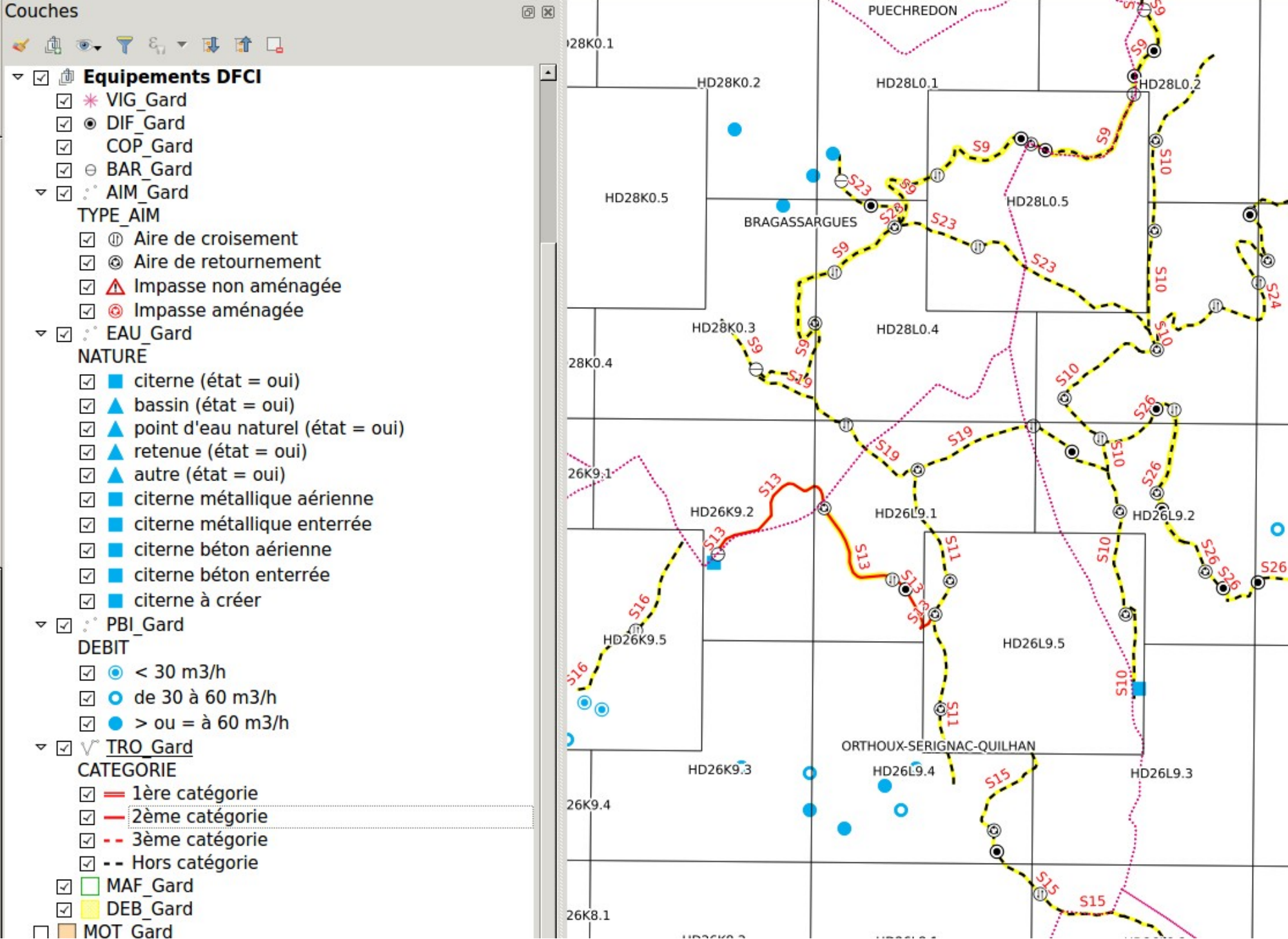
VALABRE

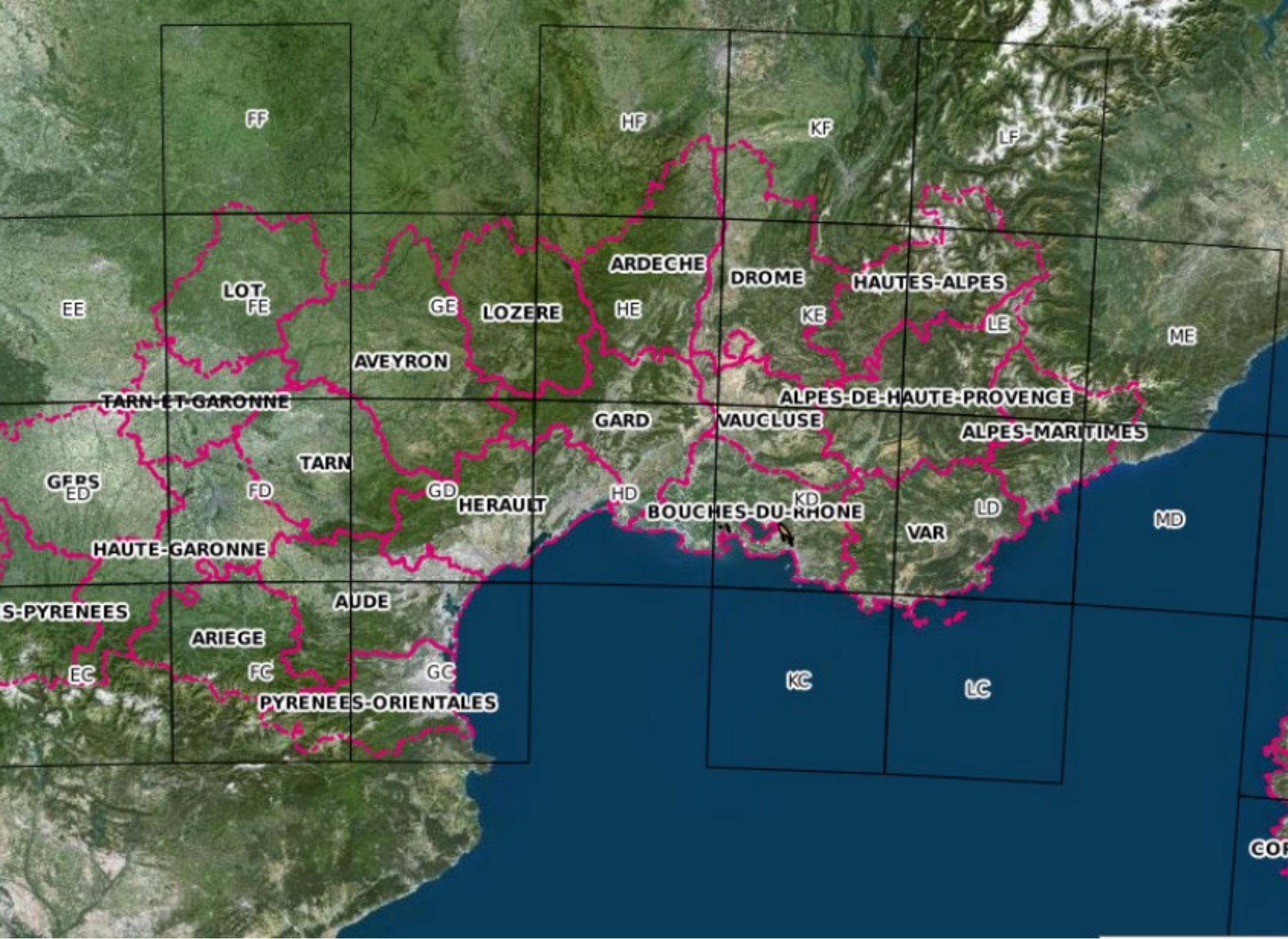
Etablissement public
pour la préservation des territoires
et des personnes

entente-valabre.com

HISTORY: CONSOLIDATE DATA BETWEEN PARTNERS

- **Data**: fire fighting infrastructure: water tankers, tracks, watchtowers + standardized grids + base layers
- **Harmonization and centralization** between actors:
  - list of **layers** to share (name, metadata, ontology)
  - agree on data structure (fields, constraints, etc.)
  - create common glossary
  - aggreement on data styling (symbols, colors, etc.)
- **Spatial extent**: French Mediterranean areas (125 965 km2)
- **Vectors** 200 Mo / **Rasters** 30Go


Couches
Equipements DFCI
VIG_Gard
DIF_Gard
COP_Gard
BAR_Gard
AIM_Gard
TYPE_AIM
Aire de croisement
Aire de retournement
Impasse non aménagée
Impasse aménagée
EAU_Gard
NATURE
citerne (état = oui)
bassin (état = oui)
point d'eau naturel (état = oui)
retenue (état = oui)
autre (état = oui)
citerne métallique aérienne
citerne métallique enterrée
citerne béton aérienne
citerne béton enterrée
citerne à créer
PBI_Gard
DEBIT
< 30 m3/h
de 30 à 60 m3/h
> ou = à 60 m3/h
TRO_Gard
CATEGORIE
1ère catégorie
2ème catégorie
3ème catégorie
Hors catégorie
MAF_Gard
DEB_Gard
MOT_Gard
PUECHREDON
HD28K0.1
HD28K0.2
HD28L0.1
HD28L0.2
HD28K0.5
HD28L0.5
BRAGASSARGUES
HD28K0.3
HD28L0.4
28K0.4
26K9.1
HD26K9.2
HD26L9.1
HD26L9.2
HD26K9.5
HD26L9.5
ORTHOUX-SERIGNAC-QUILHAN
HD26K9.3
HD26L9.4
HD26L9.3
26K9.4
26K8.1
S9
S10
S11
S13
S15
S16
S19
S23
S24
S26


FF
HF
KF
LF
ARDECHE
DROME
HAUTES-ALPES
LOT
FE
EE
GE
LOZERE
HE
KE
LE
ME
AVEYRON
TARN-ET-GARONNE
ALPES-DE-HAUTE-PROVENCE
GARD
VAUCLUSE
ALPES-MARITIMES
TARN
GERS
ED
FD
GD
HERAULT
HD
KD
BOUCHES-DU-RHONE
LD
VAR
MD
HAUTE-GARONNE
AUDE
S-PYRENEES
ARIEGE
EC
FC
GC
KC
LC
PYRENEES-ORIENTALES

SOFTWARES ALREADY IN USE

- QGIS used by *Valabre* workers, but some actors also use Mapinfo/ESRI/Geoconcept
- PostgreSQL to store and process data:
  - Dedicated server (hosted by 3liz)
- Lizmap Web Client / QGIS Server to publish web maps from QGIS

LIZMAP WEB CLIENT ?

- **QGIS projects published as full featured web maps**
  - Lizmap QGIS plugin to configure the map
  - Respects QGIS project properties: styling, layer tree, attribute table, form editing, printing via composers, relations between layers, etc.
- **Authentication and group rights**: restrict map access, editing tools, data export, etc.

Equipements

Aires de jeux

Voir la carte | Description

Culture

Voir la carte | Description

Petite enfance

Voir la carte | Description

Scolaire et Périscolaire

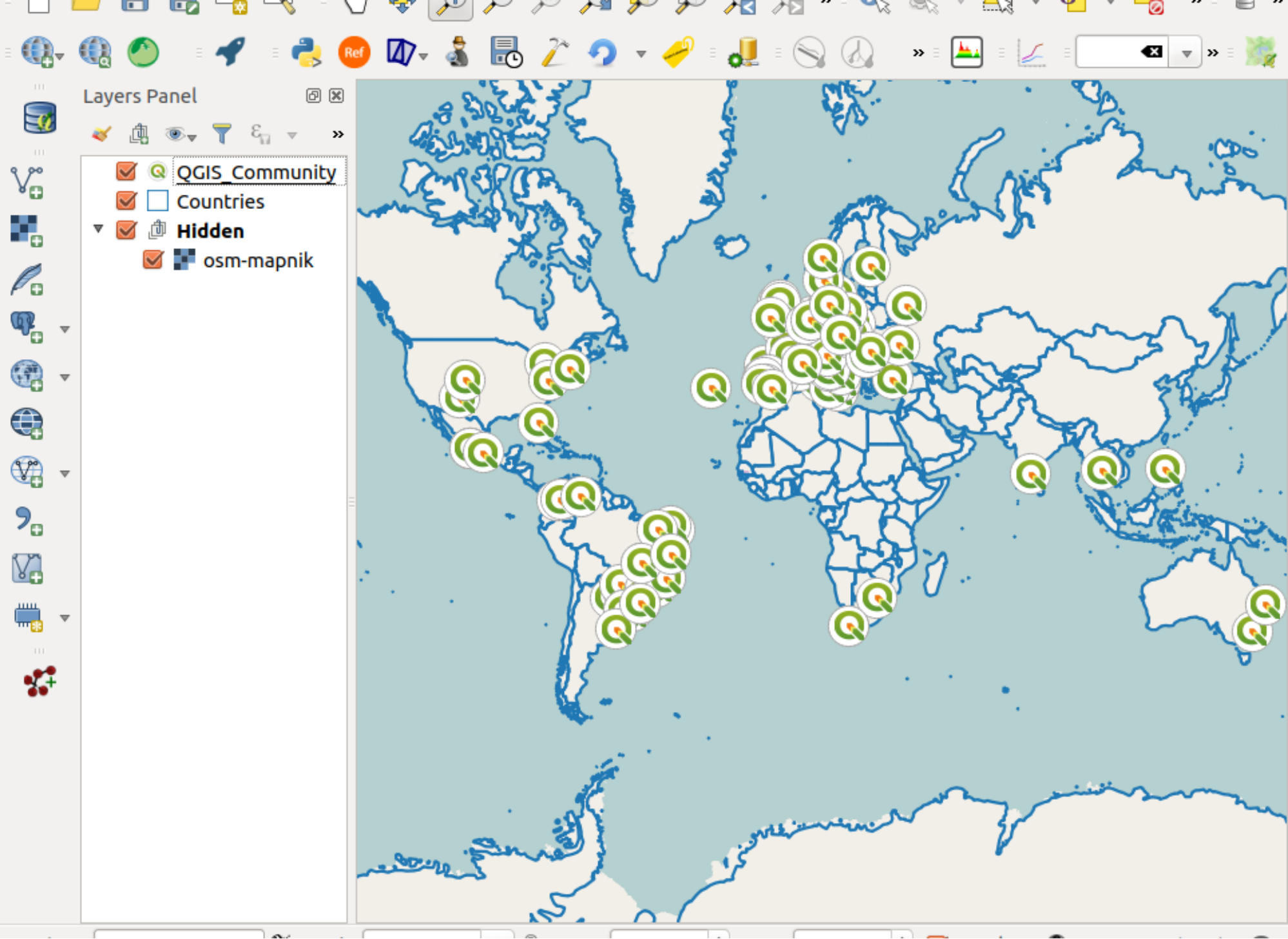
Voir la carte | Description

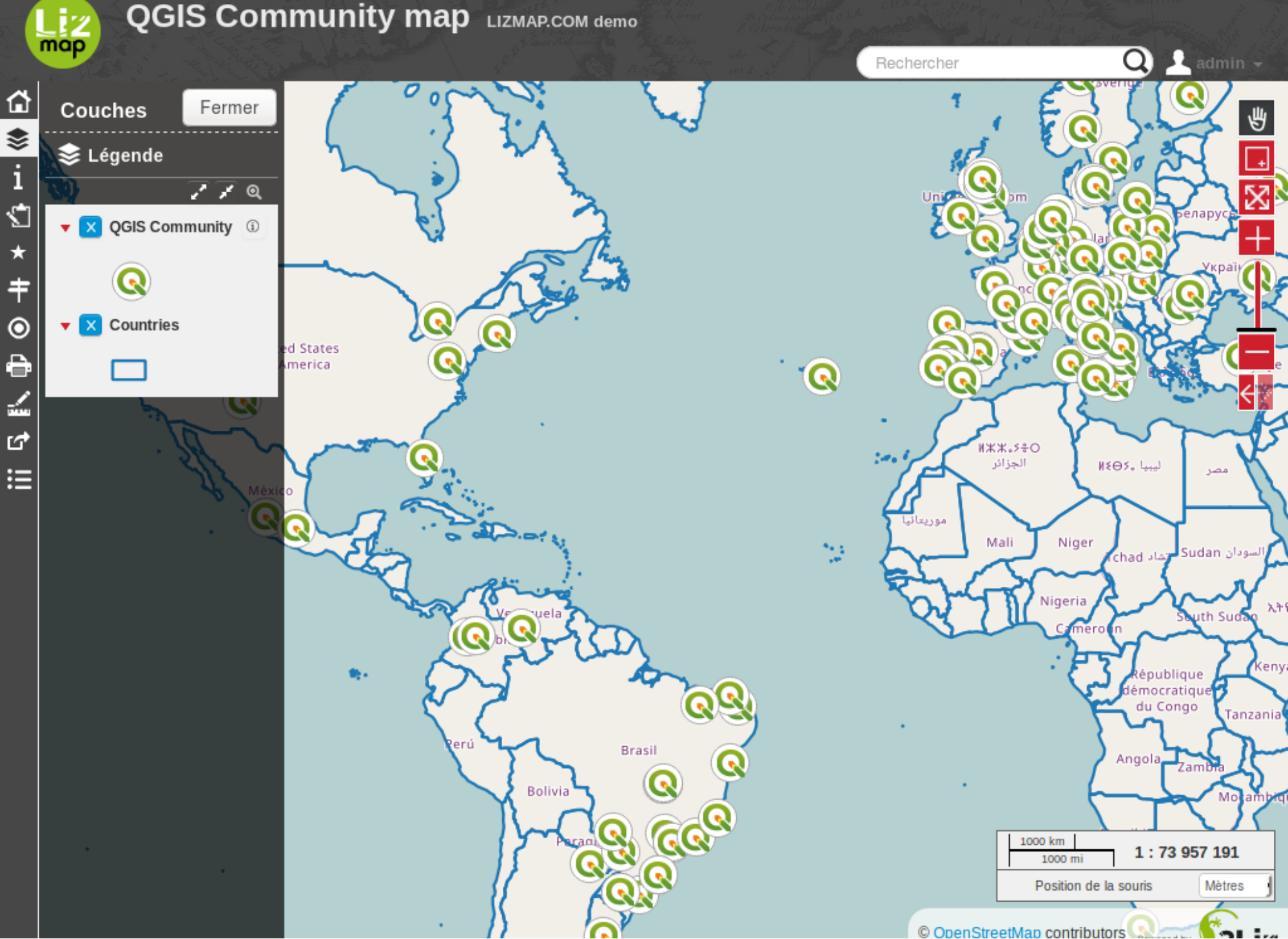
Sports

Voir la carte | Description

Tous équipements

Voir la carte | Description


Layers Panel
QGIS_Community
Countries
Hidden
osm-mapnik


QGIS Community map
LIZMAP.COM demo
Rechercher
admin
Couches
Fermer
Légende
QGIS Community
Countries
1000 km
1000 mi
1 : 73 957 191
Position de la souris
Mètres
© OpenStreetMap contributors

Observatoires de l'Aduga

Atlas des zones d'activités

Rue, Ville

Connexion

Localisation

Nom Pôle

Epci

Légende

Etablissement

Foncier

Phasage foncier

- Surface occupée
- Surface disponible
- Réserve foncière constituée, en p
- Occupation prévue à moyen term
- Surface vacante (disp. moyen/lor
- Potentiel de renouvellement urba

Pôle

- Pôle

Site

- Création
- Existant
- Extension

Fond de carte

Cadastre

Permalien

Zone Montières Activités ières

CHU Amiens P

alia

ZAC de Renancourt

200 m
1000 ft

1 : 18 000

Position de la souris

Mètres

Édition

Édition

Annuler

Cheminements

Cheminement | Localisation | Avancement

Caractéristiques techniques | Système

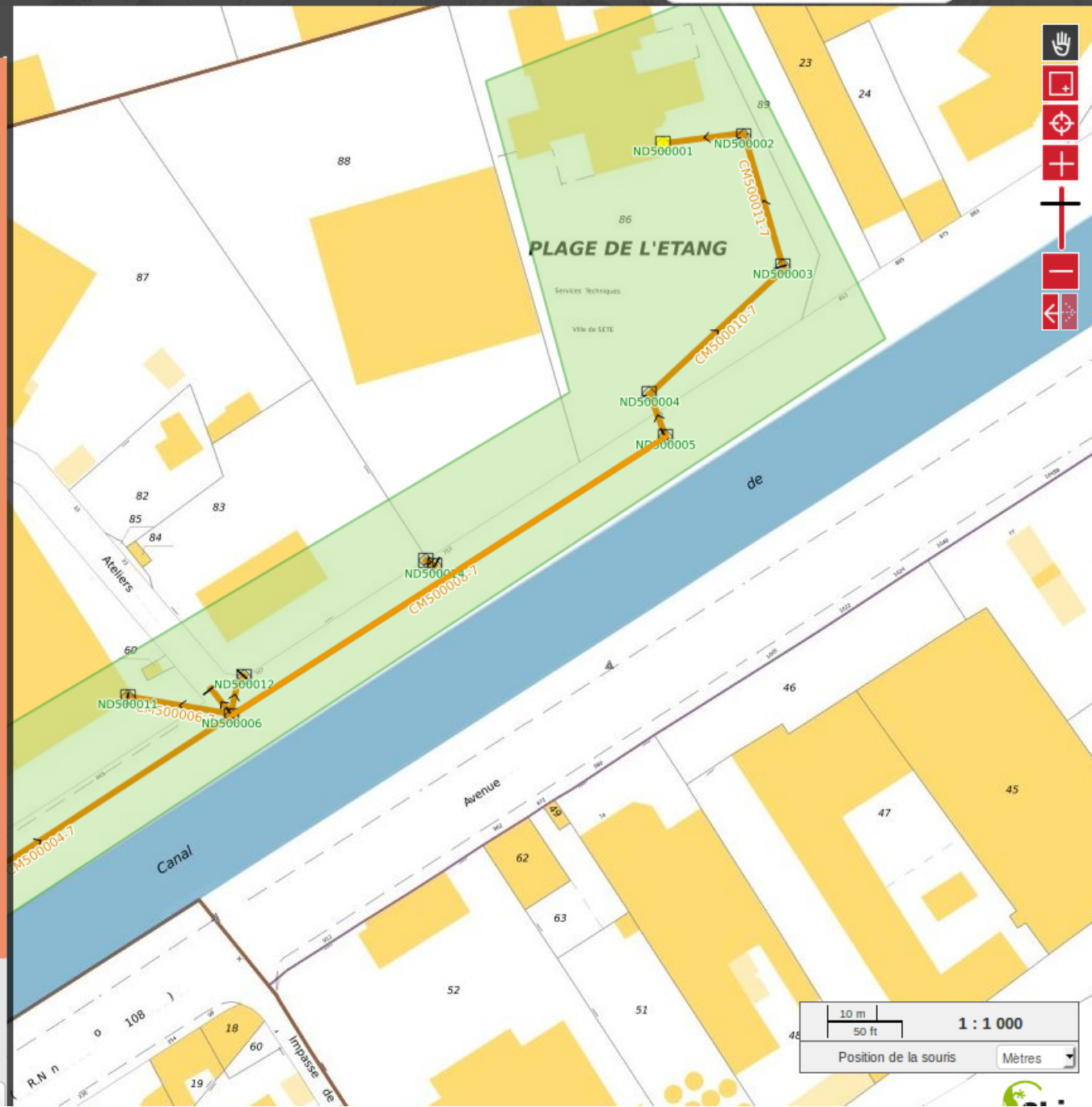
Caractéristiques principales

Code	CM000000500008
Code tiers	BB7-8
Noeud extrémité 1	ND000000500006
	Item sélectionné
Noeud extrémité 2	ND000000500005
	Item sélectionné
Cheminement extrémité 1	
Cheminement extrémité 2	

Référentiel de réseau

Code ref réseau 1	
Code ref réseau 2	
Code ref réseau 3	BB7-Inventaire2016
Code ref réseau 4	

Fermer



Montpellier Transports Montpellier

Rechercher

Connexion

Couches Fermer

Légende

Edition layers

- Points of interest
- Bicycle rides
- Areas of interest

Transport

Sous-Quartiers

Quartiers

Fond de carte

OSM Stamen Toner

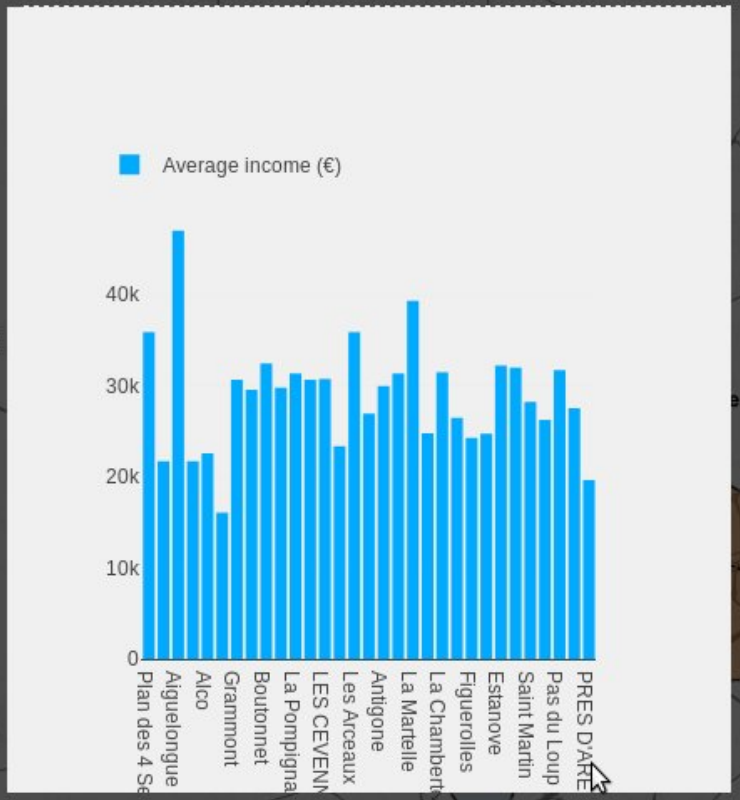
Statistiques

Localisation

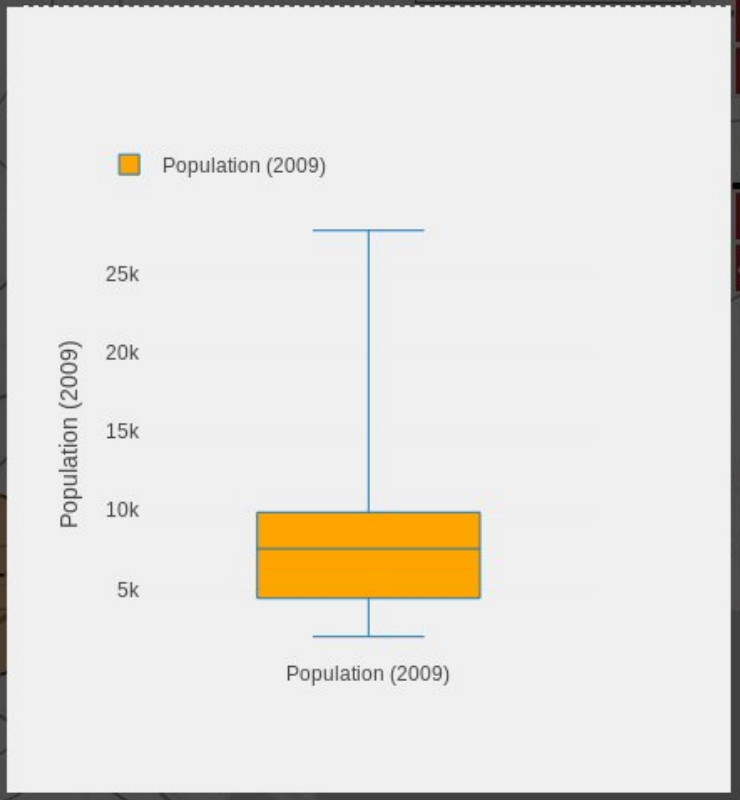
Name Quartiers

Saint-Gély-du-Fesc

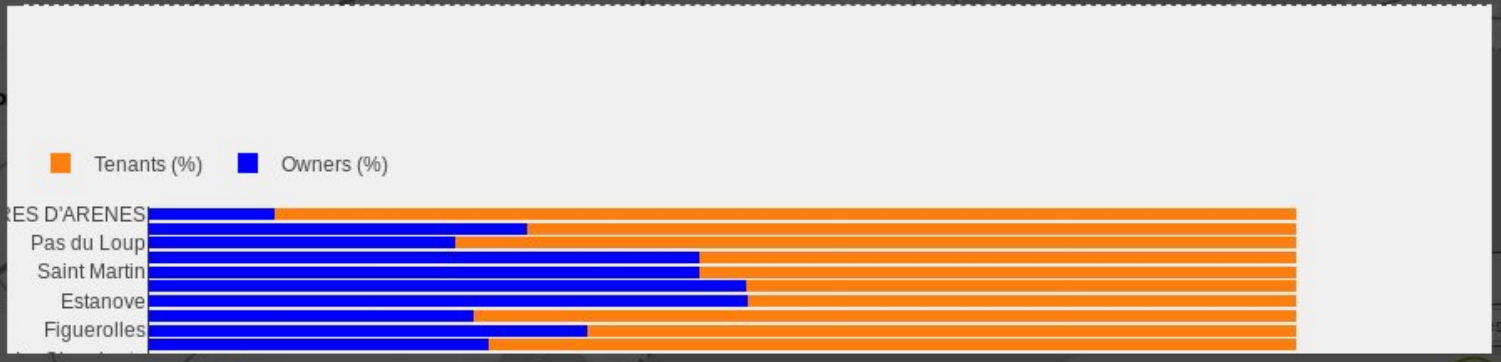
Average income (€)



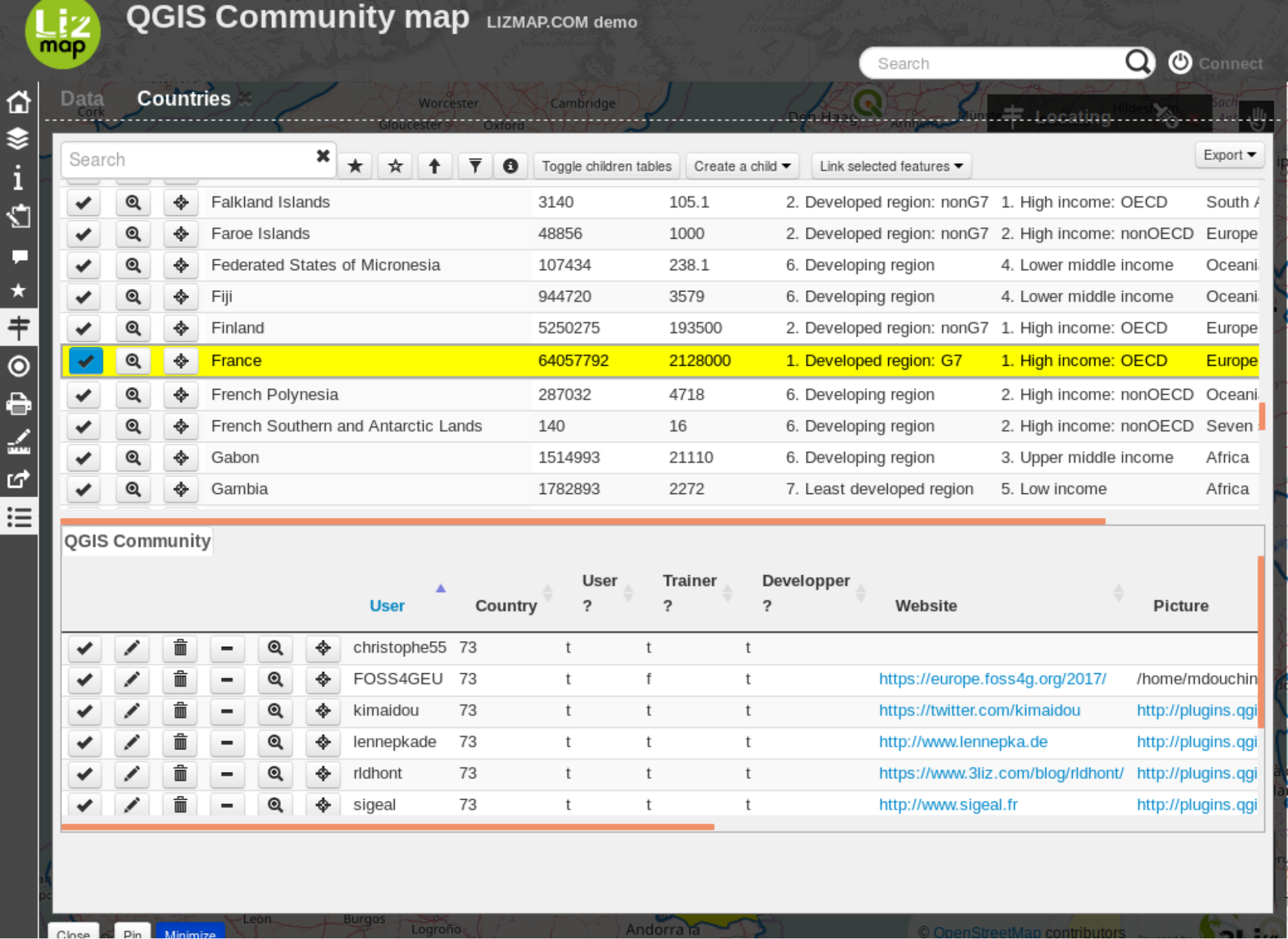
Population box plot



Repartition between tenants & owners



Lattes


QGIS Community map
LIZMAP.COM demo
Search
Connect
Data
Countries
Locating
Search
Toggle children tables
Create a child
Link selected features
Export
Falkland Islands 3140 105.1 2. Developed region: nonG7 1. High income: OECD South A
Faroe Islands 48856 1000 2. Developed region: nonG7 2. High income: nonOECD Europe
Federated States of Micronesia 107434 238.1 6. Developing region 4. Lower middle income Oceani
Fiji 944720 3579 6. Developing region 4. Lower middle income Oceani
Finland 5250275 193500 2. Developed region: nonG7 1. High income: OECD Europe
France 64057792 2128000 1. Developed region: G7 1. High income: OECD Europe
French Polynesia 287032 4718 6. Developing region 2. High income: nonOECD Oceani
French Southern and Antarctic Lands 140 16 6. Developing region 2. High income: nonOECD Seven
Gabon 1514993 21110 6. Developing region 3. Upper middle income Africa
Gambia 1782893 2272 7. Least developed region 5. Low income Africa
QGIS Community
User
Country
User ?
Trainer ?
Developper ?
Website
Picture
christophe55 73 t t t
FOSS4GEU 73 t f t https://europe.foss4g.org/2017/ /home/mdouchin
kimaidou 73 t t t https://twitter.com/kimaidou http://plugins.qgi
lennepkade 73 t t t http://www.lennepka.de http://plugins.qgi
rldhont 73 t t t https://www.3liz.com/blog/rldhont/ http://plugins.qgi
sigeal 73 t t t http://www.sigeal.fr http://plugins.qgi
Close
Pin
Minimize
© OpenStreetMap contributors

POSTGRESQL VALABRE DATABASE

- One schema per actor (administrative area) + schema dedicated for admins or auditing.
- Rights managements via GRANT on schemas and tables
- Procedures, triggers and Python services:
  - default values,
  - history audit,
  - send emails to admins/users depending on data modification/validation,
  - copy data accross local schemas and global schema

PROJECT OBJECTIVES

SEE AND EDIT DATA OFFLINE

MAINLY IN THE FIELD

REQUIREMENTS AND CONSTRAINTS

- **GIS features**: multiple layers, data editing, baselayers (aerial photos, dem), attribute table, etc.
- **Based on QGIS projects** to simplify the workflow & respect harmonized styling
- Use **PostgreSQL offline**: constraints, triggers, views (buffers, etc.)
- **No internet connection** or connection **not stable or expensive** -> work offline
- **Heavy datasets**

FEATURES REQUIREMENTS

- **Rich forms**: lists, checboxes, images, date fields, etc.
- Authentication and rights management -> login saved in data
- **Tools**: data editing, attribute tables, popups, filters, relations, etc.
- **Synchronization**
  - between the **offline database copies**
  - and the **central server database**.
  - No conflit resolution needed.

STUDIED SOLUTIONS / NEEDS

- Windows tablets -> **Android tablets** (price)
- Simple field data collection tools (ODK) -> **QGIS based** mobile solution (full-featured)
- QField -> **GeoPoppy** (PostgreSQL, Auth, known solution)

Valabre chose to test **GeoPoppy**

GEOPOPPY

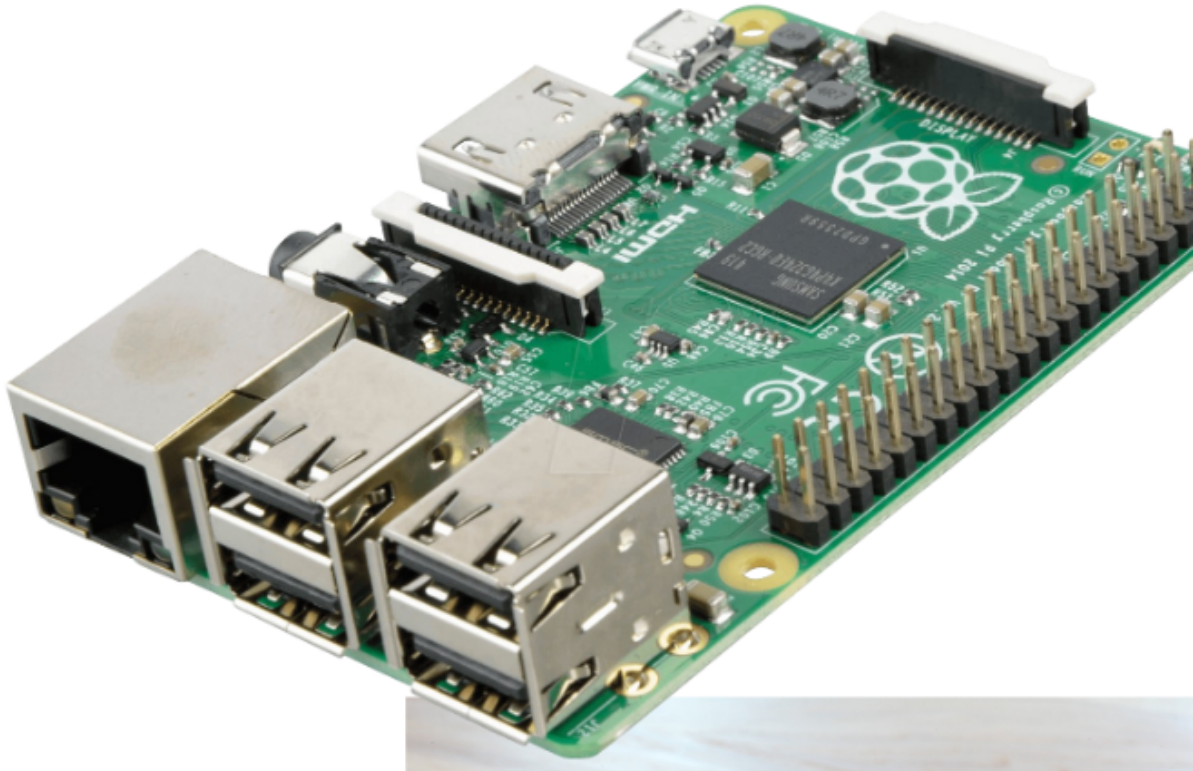
DESCRIPTION / TESTING PHASE

GEOPOPPY

A spatial server in a box

- **Hardware**: RaspberryPi / Battery / Tablet or smartphone or laptop with a web browser (Firefox)
- **Software**: Lizmap Web Client / QGIS Server / PostgreSQL / FTP Server.
- **Main conceptor**: **Julien Ancelin** with some help by 3liz
- Based on **Docker**
- **Already used** by researchers in France, Ivory Coast, Madagascar, etc.

Matériel



Le Raspberry Pi est un
nano-ordinateur
monocarte

35€

Ram : 1 Go

Nombre de processeur : 4

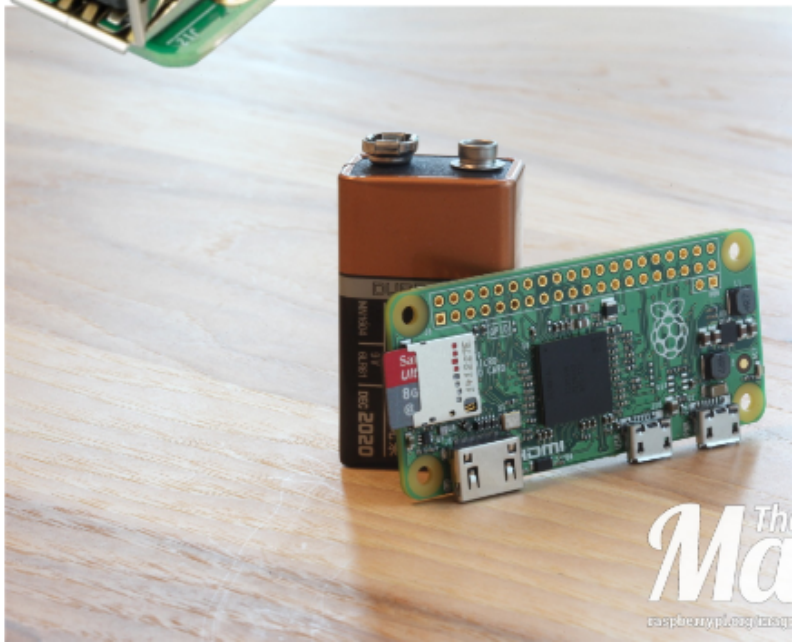
Processeur : ARMv7 (~6x plus puissant que le précédent)

Cadence du processeur : 900 Mhz

Stockage : Carte MicroSD

Ports : 4 USB 2.0, 1 Ethernet, GPIO,

Puissance : 600 mA (3,5 W)



Géo Poppy

Serveur cartographique

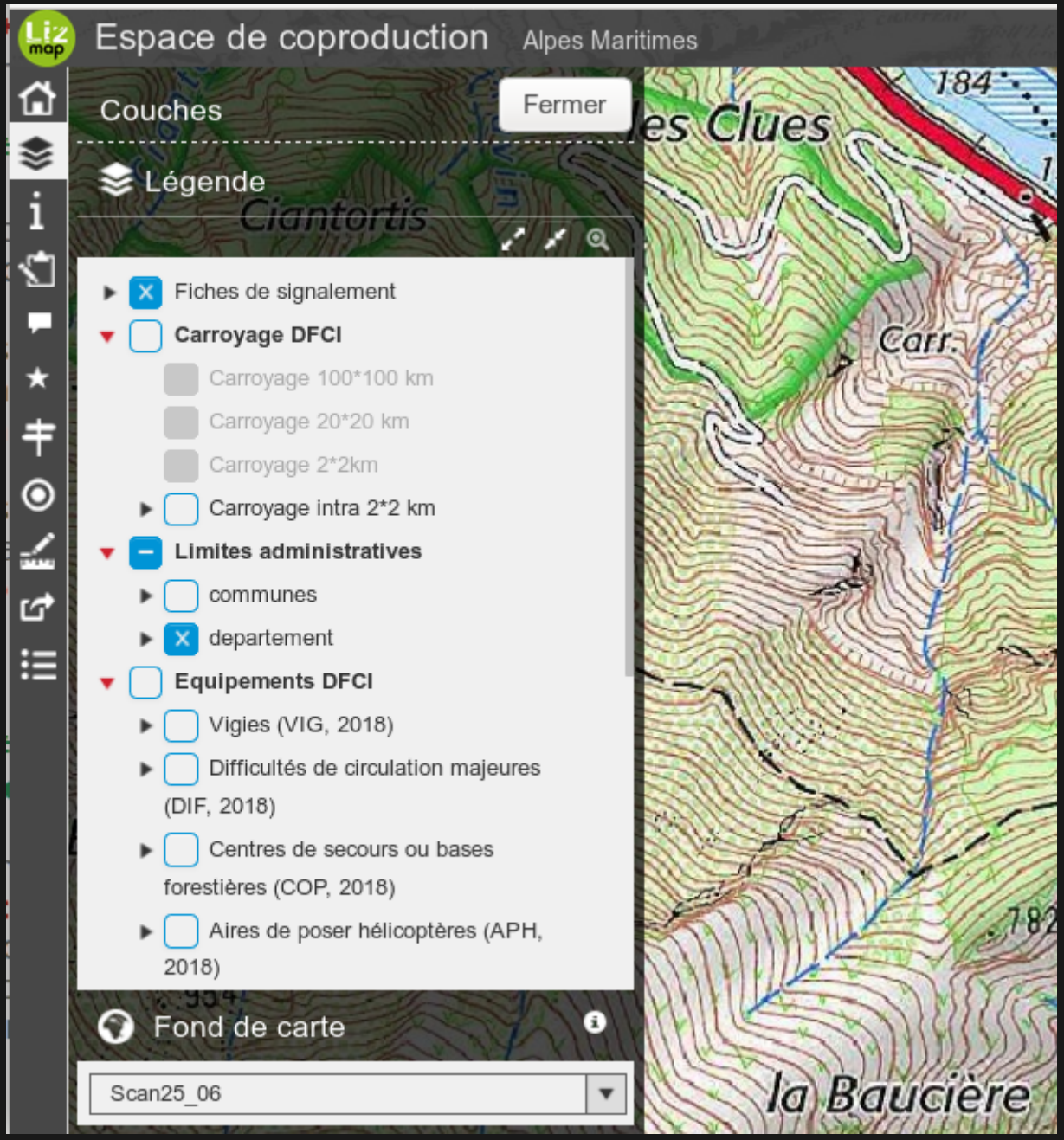
Bases de données

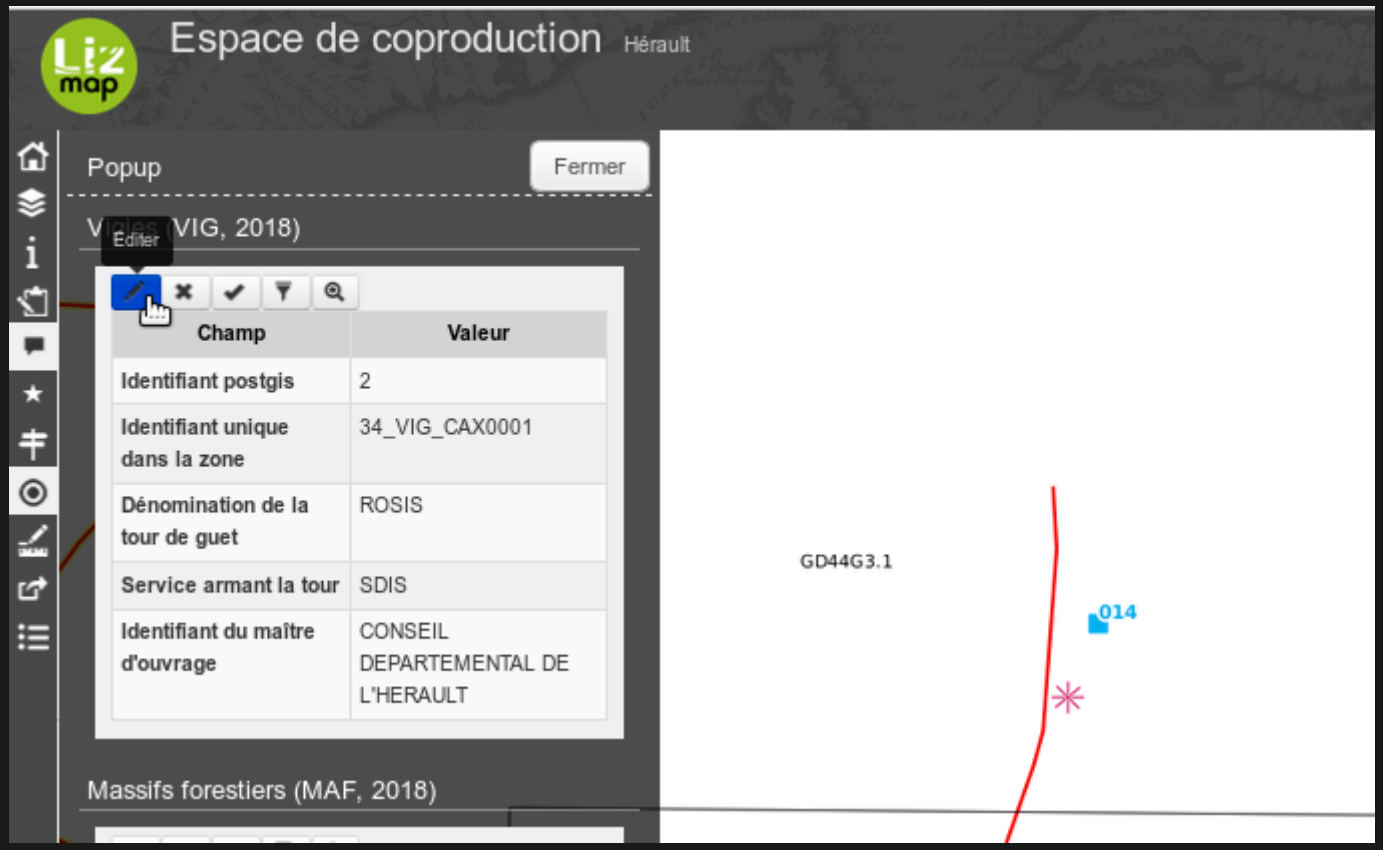
GEOPOPPY CONS

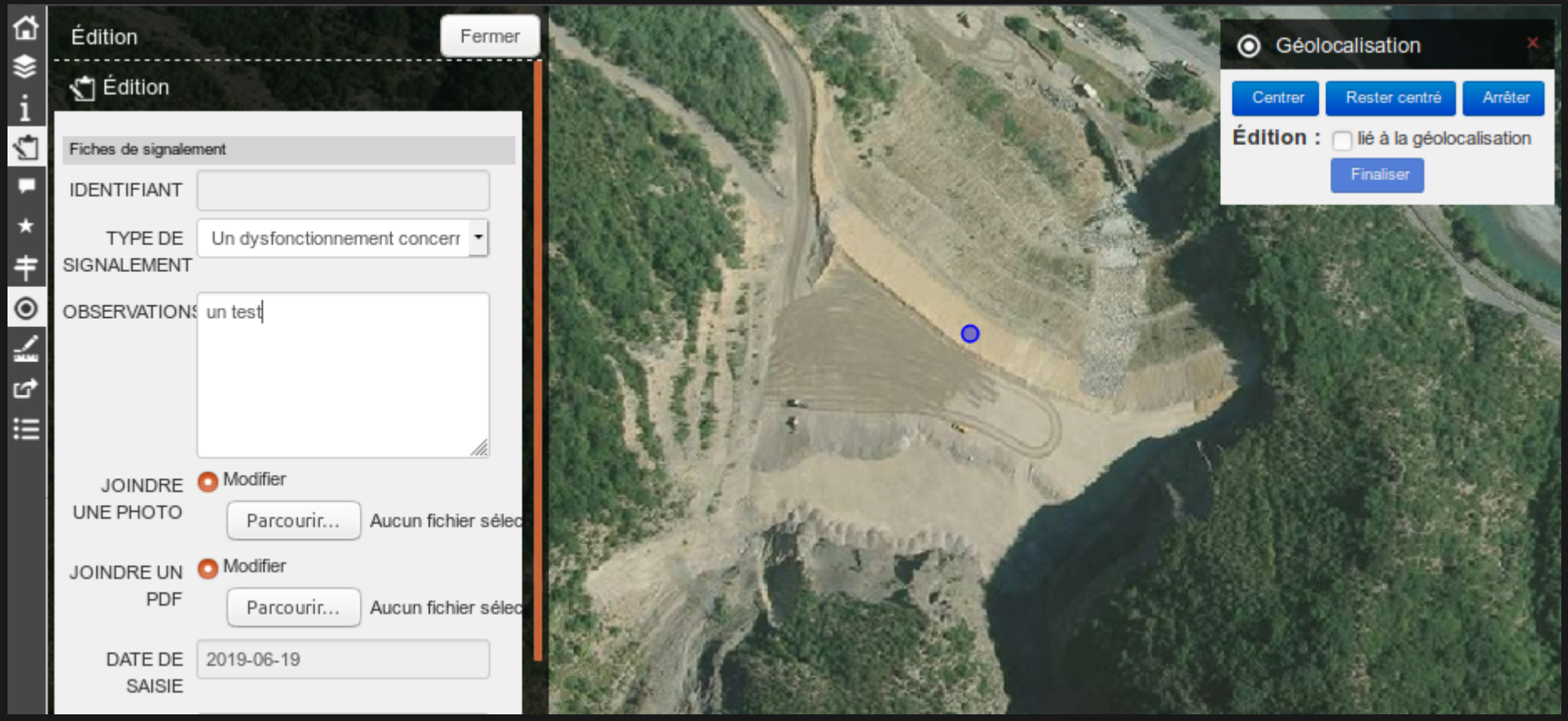
- **Additionnal devices**: *Do-It-Yourself look&feel*
- Tied to the **web browsers capabilities**: geolocation API, save files locally, etc.
- Lizmap interface is responsive but **not dedicated to mobile** -> some improvements needed
- Cannot connect to 3/4/5G and GeoPoppy WIFI **at the same time** -> **Android OS restriction**

GEOPOPPY PROS

- **OpenSource software** and **affordable hardware**
- Work **offline**
- **No new software**: QGIS Server / Lizmap / PostgreSQL
- **Known worklow** to publish the web maps and data to the central server
- **PostgreSQL powered** : views, constraints, triggers.
- **QGIS Server powered**: all raster/vector formats (no conversion needed)
- **Lizmap powered**: authentication and rigths, rich forms from QGIS, atlas, styles, etc.


Espace de coproduction
Alpes Maritimes
Couches
Fermer
Légende
Ciantortis
Fiches de signalement
Carroyage DFCI
Carroyage 100*100 km
Carroyage 20*20 km
Carroyage 2*2km
Carroyage intra 2*2 km
Limites administratives
communes
departement
Equipements DFCI
Vigies (VIG, 2018)
Difficultés de circulation majeures (DIF, 2018)
Centres de secours ou bases forestières (COP, 2018)
Aires de poser hélicoptères (APH, 2018)
Fond de carte
Scan25_06
es Clues
184
Carr.
la Baucière


Espace de coproduction
Hérault
Popup
Fermer
VIG, 2018)
Editer
Champ
Valeur
Identifiant postgis
2
Identifiant unique dans la zone
34_VIG_CAX0001
Dénomination de la tour de guet
ROSIS
Service armant la tour
SDIS
Identifiant du maître d'ouvrage
CONSEIL DEPARTEMENTAL DE L'HERAULT
Massifs forestiers (MAF, 2018)
GD44G3.1
014


Édition
Fermer
Édition
Fiches de signalement
IDENTIFIANT
TYPE DE SIGNALEMENT
Un dysfonctionnement concern
OBSERVATIONS
un test
JOINDRE UNE PHOTO
Modifier
Parcourir...
Aucun fichier sélec
JOINDRE UN PDF
Modifier
Parcourir...
Aucun fichier sélec
DATE DE SAISIE
2019-06-19
Géolocalisation
Centrer
Rester centré
Arrêter
Édition :
lié à la géolocalisation
Finaliser

SYNCHRONIZATION

CONCEPTS AND TOOLS

SYNCHRONIZATION KEY IDEAS

- Two phases
  - **package** QGIS project & database from the central Lizmap/PostgreSQL server -> **deploy** to the GeoPoppy
  - **Two-way db data sync** and **upload new media** to the server
- **No conflicts management** -> last action wins
- **UUID field** in every table: *c0558823-d20a-40c8-903c-0d8c4f4dad7d*
- Each GeoPoppy defined by its **unique UUID**
- On update, **only changed fields** data is synchronized

SYNCHRONIZATION TOOLS

- Based on **PostgreSQL triggers/functions**: *audit.sql* with additionnal sync procedures
- **Log every actions** with many information :
  - initial raw data before change & changed fields,
  - user and app names, timestamp,
  - uuid of the source device, etc.
- **Centralize all audit** log in the main server
- **Sync process**:
  - Get central server modifications
  - Then send local modifications

EXAMPLE LOG FOR INSERT

```
event_id | 24
schema_name | dfci_vaucluse
table_name | VIG_Vaucluse
session_user_name | "geopoppy@valabre"
action_tstamp_tx | 2019-08-13 15:12:06.126626+02
action | I
row_data | "id"=>"47", "uid"=>"cb0344c4-c936-378a-2fae-96dd031a820b"
"login"=>"j.doe|John|Doe|", "hauteur"=>"34", "nom_vig"=>"Vigie ", "s
changed_fields |
sync_data | {"origin": "23e2218b-42cb-0963-eb25-8fe37cfeae50",
"replayed_by": {"2f9c2d17-fbb3-6cd2-2dbb-2b2738ba0029": "3a80a443-13
```

EXAMPLE LOG FOR UPDATE

```
event_id | 16
schema_name | dfci_bouches_du_rhone
table_name | HBE_CONTROLE
session_user_name | "geopoppy@valabre"
action_tstamp_tx | 2019-07-26 16:51:57.265702+02
action | U
row_data | "id"=>"30", "uid"=>"b714709d-129b-6a97-fe89-21260604ba0c"
"geom"=>"01010000206A080000AAF1D24D4C2C2A415839B4282D005841", "user"
"photo"=>NULL, "a_supp"=>"", "trappe"=>"inc", "date_creat"=>"2017-04
"date_modif"=>"2017-04-24", "coordonnees_x"=>NULL, "coordonnees_y"=>
changed_fields | "a_supp"=>"NON", "trappe"=>"NON", "date_modif"=>"20
"sync_data" | {"origin": "2c192051-2cc9-deda-fab7-f97e18b1caa6",
"replayed_by": {"2f9c2d17-fbb3-6cd2-2dbb-2b2738ba0029":
 "acfc1373-60eb-74ff-4657-df1ffc73d8a0"}}
```

SYNC TOOLS

QGIS processing algs

- A QGIS plugin as a Python processing provider
- Use it in QGIS desktop: Processing menu with algs
- Use it server-side: 3liz WPS server async implementation based on QGIS processing framework
- Use it in the GeoPoppy device: via Lizmap

WPS

Fermer

Choose a process to run

FICHIERS - Récupérer les car

Run History Help

Please fill in the form and click the RUN button

Input

Synchronizatic time*

2019-06-13T15:13:24.850311

Directory list to exclude, separated by commas.*

data

Execute

10 km
5 mi
1 : 500 000

Position de la souris

Mètres

WPS

Fermer

Choose a process to run

FICHIERS - Récupérer les car

Run | History | Help

Start	End	Status	Actions
13/06/2019 à 17:17:17	13/06/2019 à 17:17:29	✓	
13/06/2019 à 17:15:37			

10 km
5 mi
1 : 500 000

Position de la souris Mètres

CONCLUSION

FEEDBACK, ROADMAP, IDEAS

FEEDBACK

- **It works !**
  - in the field,
  - but also as an offline **portable full GIS server** (WMS, WFS, WPS, PostgreSQL, etc.)
  - more tests needed and QGIS plugin not released yet
- **Simplify the workflow** : easier with good QGIS & PostgreSQL knowledge
- Improve **PyQGIS WPS Server** and **Lizmap WPS client**
- Complex QGIS projects can be **slow to render**
- **Lizmap responsive web interface** can be improved

GEOPOPPY ON ANDROID !

- No additionnal hardware devices needed: **only your Android device** thanks to UserLand
- Much **better performances**
- Use **3/4/5G** in the field: sync and display external layers (WMS, WFS, etc.)
- **PostgreSQL** running on Android -> can also be used with QField or Input
- **Almost production ready**: some work needed to package this solution, add doc, etc.
- **Video** https://twitter.com/complementterre/status/1133836725137096705

SOME LINKS

- GeoPoppy: https://github.com/jancelin/geo-poppy/
- Julien Ancelin: https://twitter.com/complementterre/
- GeoPoppy on Android: https://github.com/jancelin/geopoppy_android
- PostgreSQL Audit: https://github.com/Oslandia/audit_trigger/
- PyQGIS WPS Server by 3liz: https://github.com/3liz/py-qgis-wps
- PostgreSQL in UserLand: https://github.com/CypherpunkArmory/UserLAnd/issues/256
- Lizmap Web Client: https://www.lizmap.com/en/

THANKS FOR YOUR ATTENTION