

# GHCON – ORTHANC CON 2023

Leibniz University, Hannover, Sep 30th



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Luis Falcon, MD





## About me

**Luis Falcón**

President, GNU Solidario

Author of GNU Health

[falcon@gnuhealth.org](mailto:falcon@gnuhealth.org)

## Education

- Computer Scientist
- Physician
- Genomics & Medical Genetics

## Activism

- Social Medicine
- Animal Rights



## GNU Solidario

- Non-for-profit organization
- Works globally
- Focused on Social Medicine
- Fights for the right of human and nonhuman animals
- NPO behind GNU Health

# From GNU Solidario



Group pic from **GNUHealthCon 2018** in Canary Islands



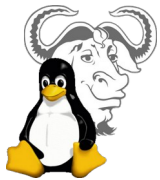
# Official GNU Package

Official GNU Package

Open Documentation

Relies on free/libre technology

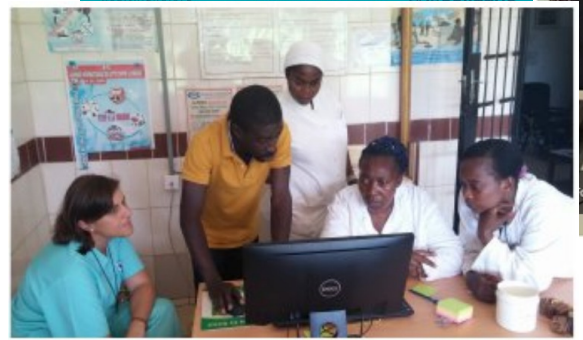
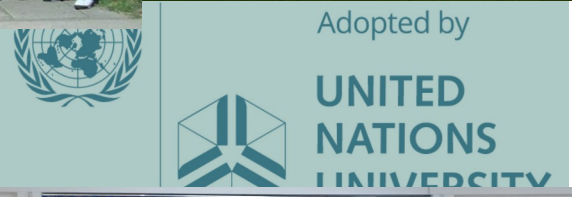
Friendly community



PostgreSQL



# GNU Health around the world



# United Nations IIGH



**International Institute for Global Health**

# World Health Organization - WHO



Immunization schedules



Training session to WHO officials from western Africa

Malaria, TB and HIV modules

List of Essential Medic

Tropical diseases

ICD-10 ICPM

Pediatric growth chart



GNU Health implementation with WHO at Bafia general hospital





# GNU Health declared Digital Public Good



Digital  
Public  
Goods  
Alliance

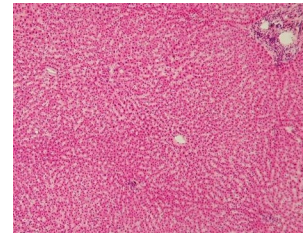
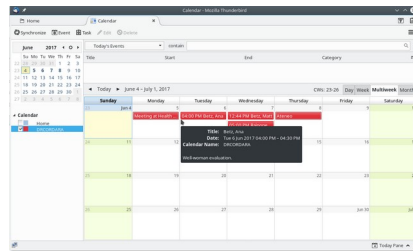
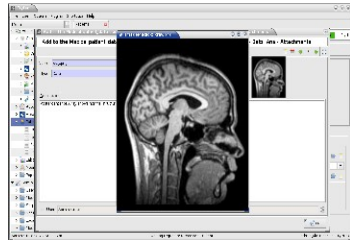
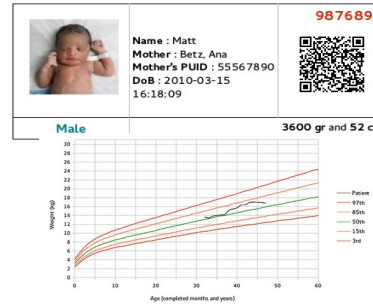
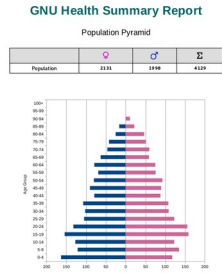
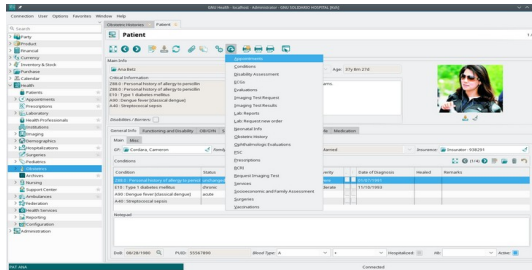




# GNUHealth ecosystem components



# GNUHealth HMIS component



MoH / Analytics

Hospital Management  
ERP

Electronic Health  
Record

Demographics /  
Social Medicine

# Dx Imaging: GNU Health + Orthanc PACS Server

- Artikel
- Währungen
- Health
  - Books of Life
  - Patients
  - Appointments
  - Prescriptions
  - Health Professionals
  - Institutions
  - Imaging
    - Orthanc
      - Patients
      - Studies
      - Dx Imaging - New
      - Dx Imaging Requests
      - Dx Imaging - Results

### Studies

5 / 7

Navigation icons: back, forward, search, refresh, print, etc.

Patient: PHENIX Description: CT2 TÊTE, FACE, SINUS

Date: 27.09.2005 Institution: HUG

Referring Physician: CHIR-PED^CHIR-PE ID: 1361

UUID: 49974143-ec23cb52-6b2a1c46-14d5daa0-0822ce1a URL:

Server: Orthanc\_Demo Test:

Orthanc Demo - Patient - Study - Series - Mozilla Firefox

https://demo.orthanc-server.com/app/register.html#seriesId=60216d2-a406a5ad31e7a7b-113ae9d9-29939f9e

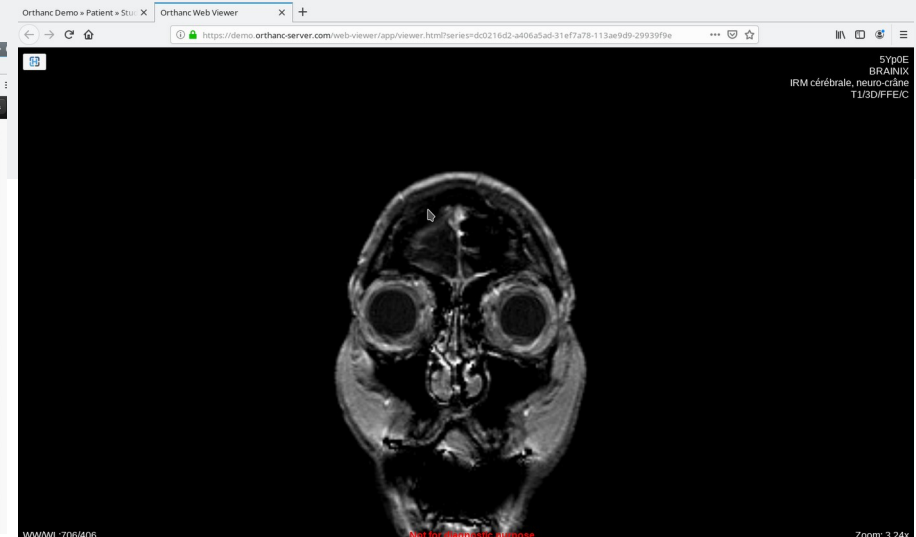
Orthanc Demo - Patient - Study - Series

Filter items...

| Instance   | SOPInstanceID   | TemporalPositionerID |
|------------|---|----------------------|
| Instance 1 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483570761 | 1                    |
| Instance 2 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483564700 | 1                    |
| Instance 3 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483557699 | 1                    |
| Instance 4 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483550696 | 1                    |
| Instance 5 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483543687 | 1                    |
| Instance 6 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483535696 | 1                    |
| Instance 7 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483539695 | 1                    |
| Instance 8 | 1.3.46.879589.11.0.0.11.4.2.0.8743.5.5396.2006120114483521694 | 1                    |

Interact

- Send to DICOMweb server
- Transfers accelerator
- Orthanc Web Viewer



# Cancer and Neurodegenerative diseases Research

GNU Health - admin@localhost/genetics - Administrator - GNU SOLIDARIO HTAL [Euro]

Window Help

Variant Phenotypes 17 / 40

Variant Phenotypes

BRCA1

| Gene & Protein                               | Variant                   | Phenotype                                   |
|--|---------------------------|---|
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007778 : p.Thr1025Ile | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007781 : p.Val1047Ala | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007782 : p.Pro1150Ser | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007796 : p.Ala1708Glu | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007799 : p.Met1775Arg | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020679 : p.Glu10Lys   | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020680 : p.Glu23Lys   | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020683 : p.Asp749Tyr  | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020690 : p.Ser1187Ile | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020691 : p.Gln1200His | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020692 : p.Arg1204Ile | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020693 : p.Lys1207Asn | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020695 : p.Ser1217Tyr | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_063212 : p.Met1775Lys | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_075666 : p.Arg1699Trp | DI-02602:Breast cancer                      |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_020896 : p.Pro47Ala   | DI-02602:Breast cancer                      |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_020900 : p.Met299Ile  | DI-02602:Breast cancer                      |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_007757 : p.Cys61Gly   | DI-01655:Ovarian cancer                     |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020702 : p.Cys1697Arg | DI-01655:Ovarian cancer                     |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_075666 : p.Arg1699Trp | DI-01655:Ovarian cancer                     |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020679 : p.Glu10Lys   | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020680 : p.Glu23Lys   | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020690 : p.Ser1187Ile | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020691 : p.Gln1200His | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020695 : p.Ser1217Tyr | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020696 : p.Phe1226Leu | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRCA1 (P38398):breast cancer 1, early onset  | VAR_020697 : p.Arg1243Gly | DI-01559:Breast-ovarian cancer, familial, 1 |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_023700 : p.Gln255His  | DI-01603:Fanconi anemia complementation gr  |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_023702 : p.Ala349Pro  | DI-01603:Fanconi anemia complementation gr  |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_023703 : p.Trp647Cys  | DI-01603:Fanconi anemia complementation gr  |
| BRIP1 (Q98X63):BRCA1 interacting protein C-t | VAR_023704 : p.Arg707Cys  | DI-01603:Fanconi anemia complementation gr  |

Connected

VMD 1.9.4a12 OpenGL Display

lhm : vmd - Konsole <2>

```
File Edit View Bookmarks Settings Help
Info) Angles: 0 Dihedrals: 0 Impropers: 0 Cross-terms: 0
Info) Bondtypes: 0 Angletypes: 0 Dihedraltypes: 0 Improper types: 0
Info) Residues: 224
Info) Waters: 3
Info) Segments: 1
Info) Fragments: 5 Protein: 2 Nucleic: 0
@
```

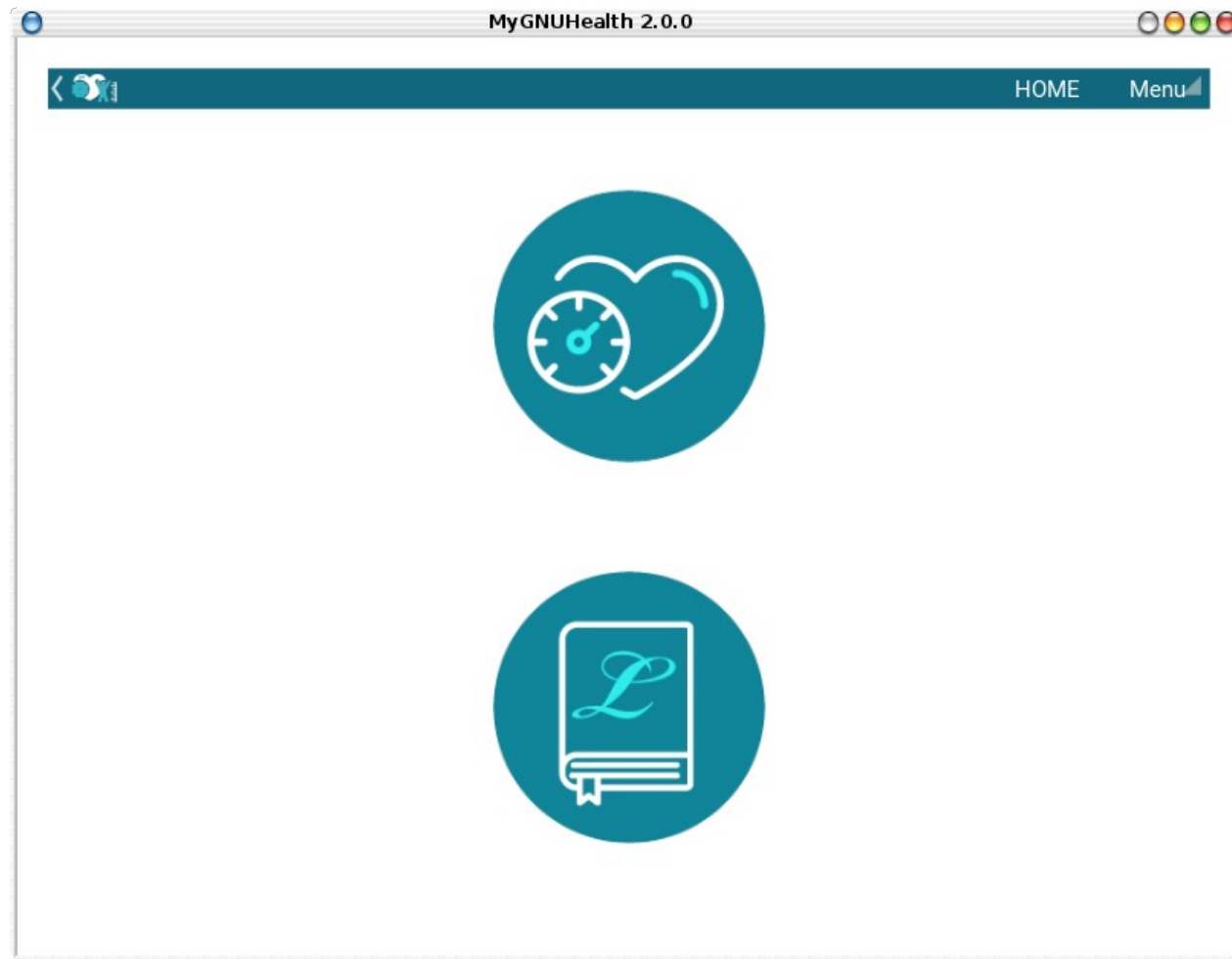
# MyGNUHealth: The Libre Personal Health Record



# MyGNUHealth: The Libre Personal Health Record

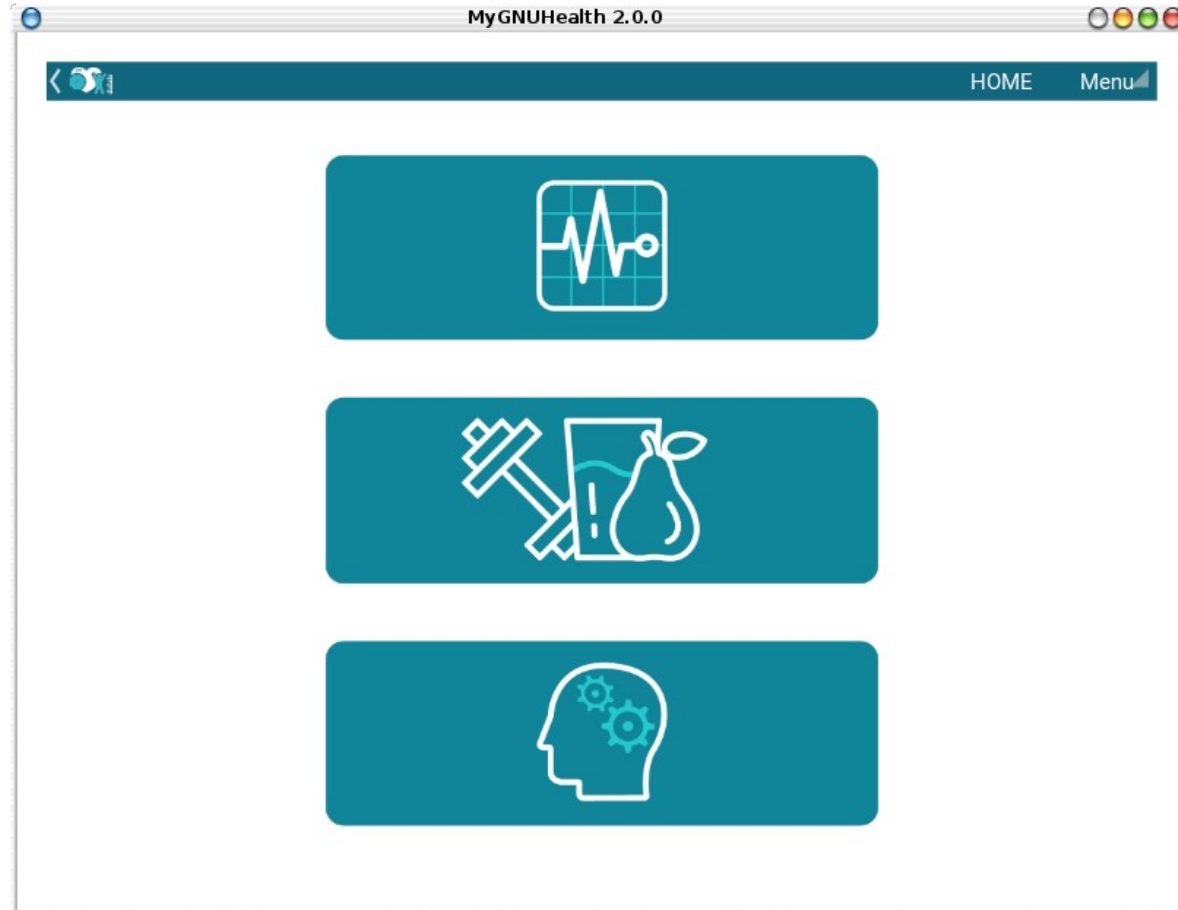


# MyGNUHealth - Components

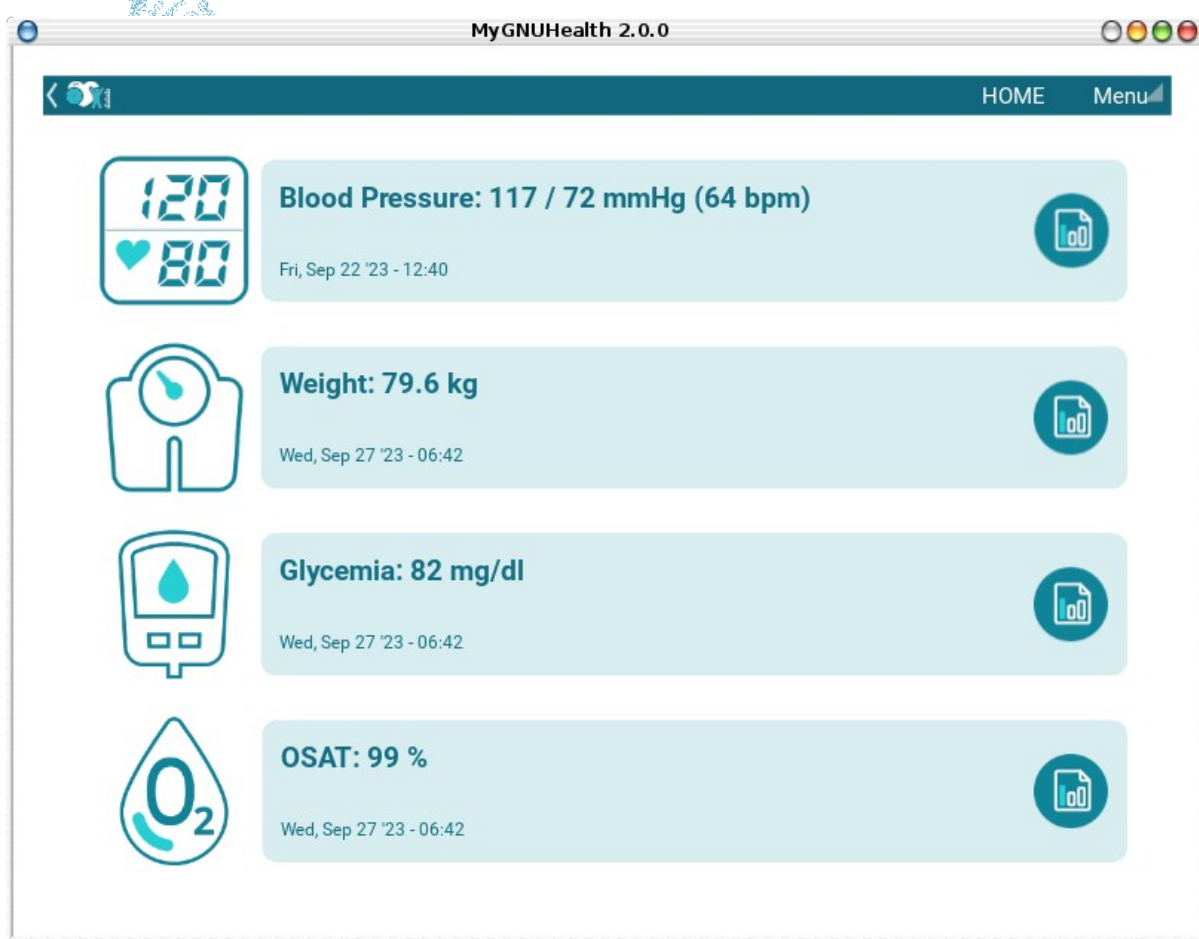




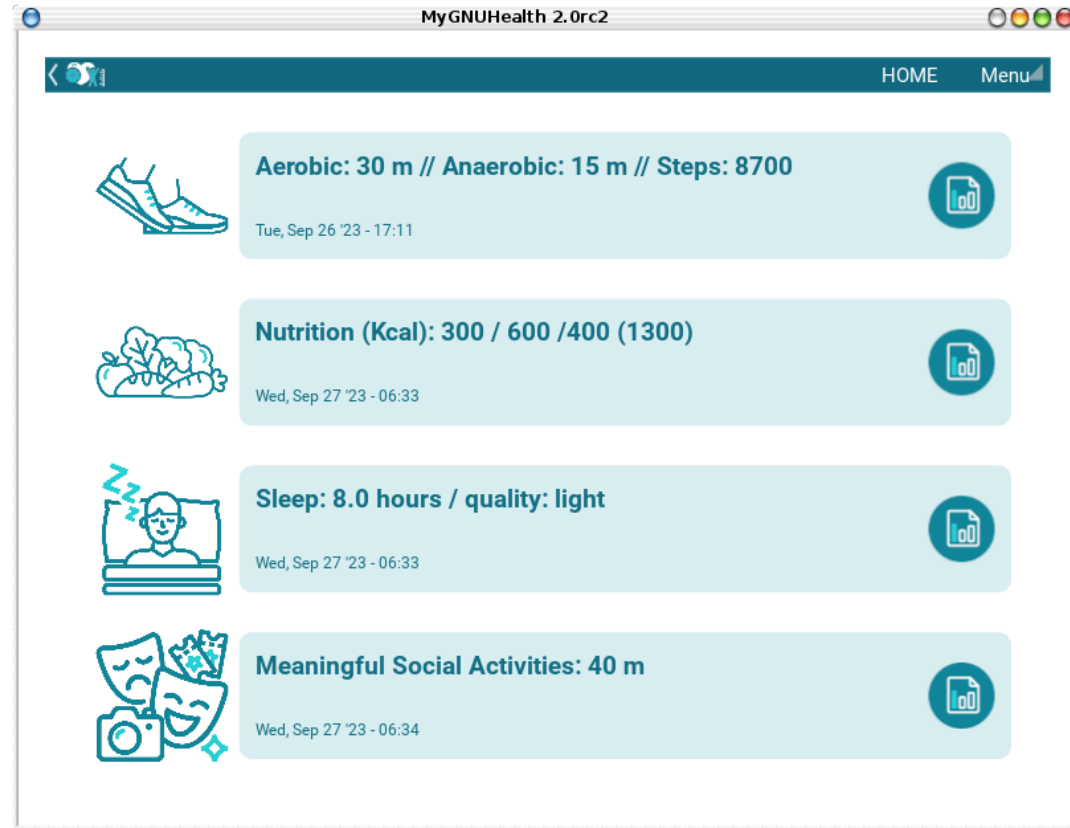
# MyGNUHealth - Domains



# MyGNUHealth - Bio



# MyGNUHealth - Lifestyle





# “Quick Psychological” assessment

MyGNUHealth 2.0.0

HOME Menu

I am feeling...

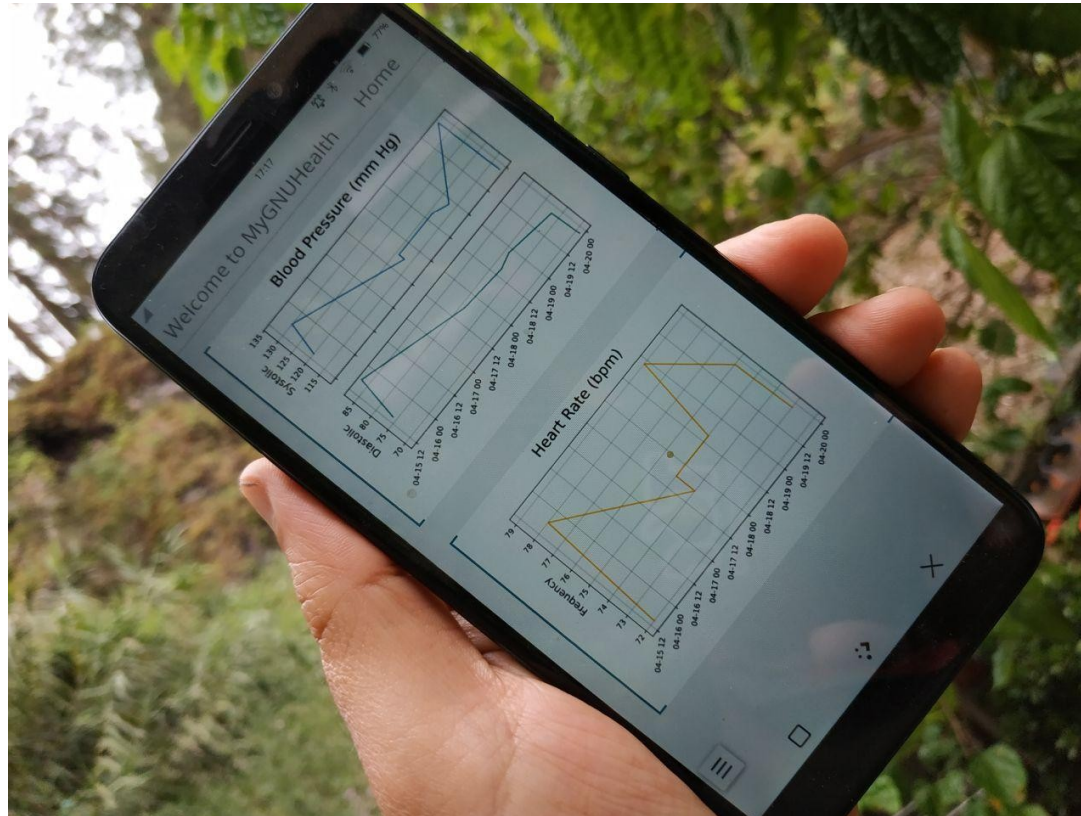
Mood  

Energy  

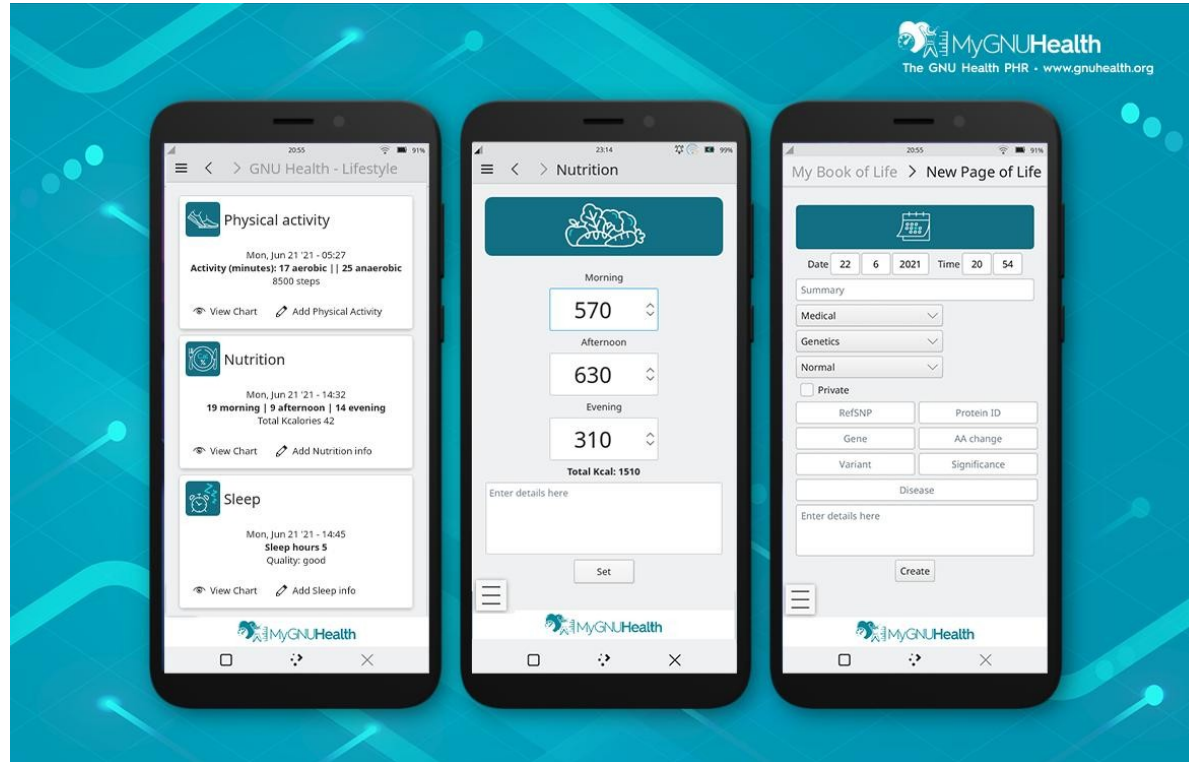
Happy at GHCON and OrthancCON 2023

DONE

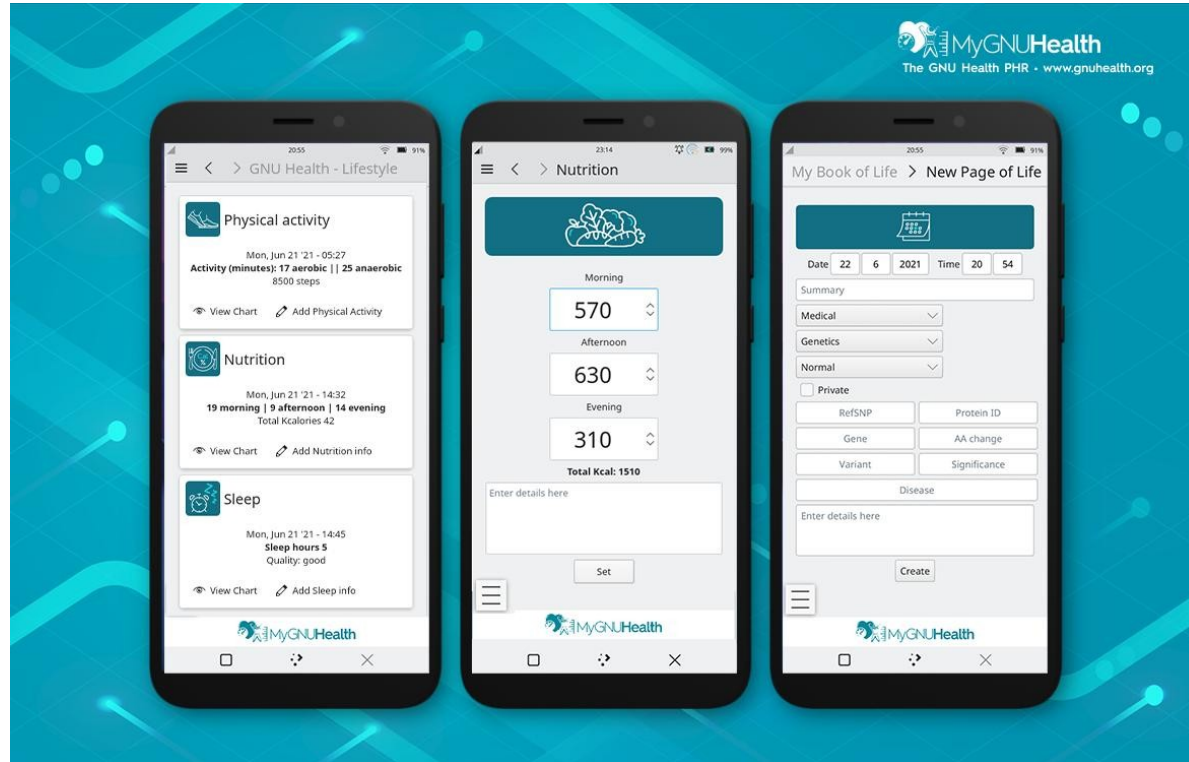
# MyGNUHealth on Linux Phones



# MyGNUHealth



# MyGNUHealth





# MyGH 2.0: Kivy framework

## Kivy: The Open Source Python App Development Framework.

Build and distribute beautiful Python cross-platform GUI apps with ease.

Kivy runs on Android, iOS, Linux, macOS and Windows.

 MIT License  14.8K Stars



Get started!

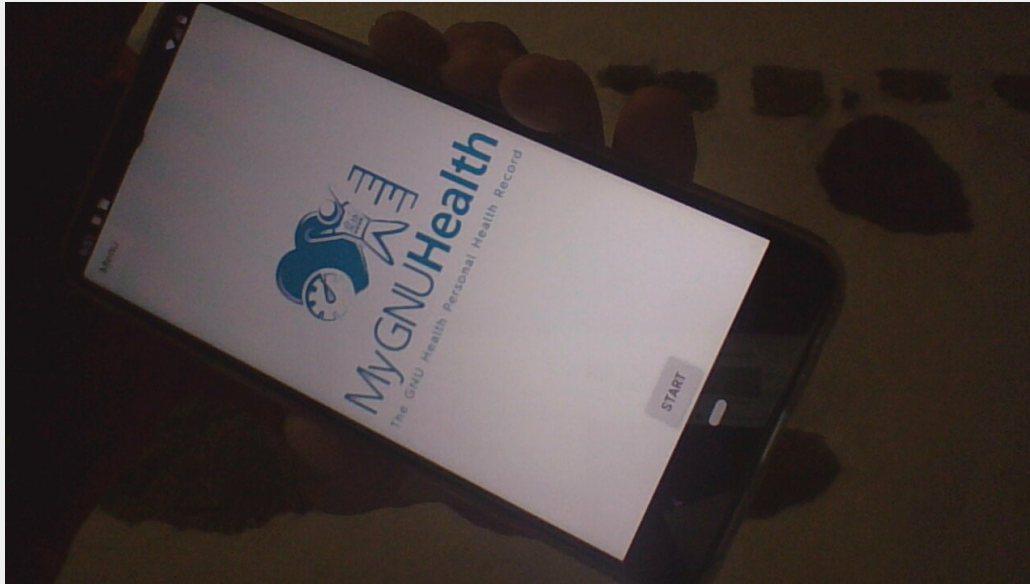
Kivy has been built to be **easy to use, cross-platform and fast.**

With a **single codebase**, you will be able to deploy apps on Windows, Linux, macOS, iOS and Android.





# MyGNUHealth on Android AOSP (dev)



# MyGNUHealth on Volla Android AOSP (dev)



kivy

Unify development

GNU/Linux Desktops

Linux phones (openSUSE, etc..)

AOSP / VollaOS

Same User Interface and  
experience

Libre / community oriented project



# MyGNUHealth on Volla Android AOSP (dev)




kivy



# GH Book of Life

MyGNUHealth 2.0.0

HOME Menu



Federation Key

|                          |                             |  |
|--------------------------|-----------------------------|--|
| Wed, Sep 27 '23<br>06:33 | lifestyle (nutrition)       | calafternoon: 600<br>calevening: 400<br>caltotal: 1300<br>keep it up |
| Wed, Sep 27 '23<br>06:33 | lifestyle (sleep)           | sleeptime: 8.0<br>sleepquality: light<br>nice rest                   |
| Wed, Sep 27 '23<br>06:34 | lifestyle (social_activity) | having dinner outside  |
| Wed, Sep 27 '23<br>06:42 | medical (self_monitoring)   | Weight: 79.6 kg<br>BMI: 23.3 kg/m2<br>having dinner outside          |



# GH Book of Life

MyGNUHealth 2.0.0

HOME Menu

Date: 30 9 2023 Time: 7 39

Summary

Domain & Context

medical health\_condition

medical

social

biographical

lifestyle

other

Relevance

Private page:

Save



# BoL Pages

MyGNUHealth 2.0.0

HOME Menu

Date: 30 9 2023 Time: 7 35

Summary

Domain & Context: medical health\_condition

Details

Relevance: normal Private page:

Save

MyGNUHealth 2.0.0

HOME Menu

Date: 30 9 2023 Time: 7 35

Summary

Domain & Context: medical lab

Details: health\_condition, encounter, procedure, self\_monitoring, immunization, prescription, surgery, hospitalization, lab

Relevance: normal

Save: dx\_imaging, genetics



# Integrating MyGNUHealth into GH Federation

GNU Health - admin@localhost/genetics - Administrator - GNU SOLIDARIO HTAL (Euro)

Window Help

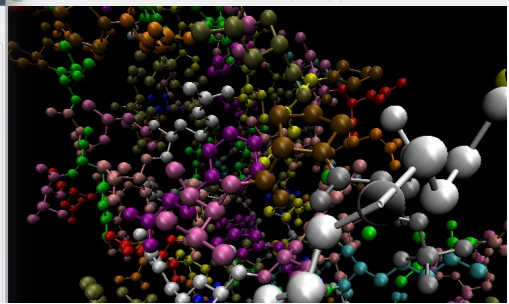
Variant Phenotypes 17 / 40

Variant Phenotypes

BRCA1

| Gene & Protein                                | Variant                   | Phenotype                  |
|---|---------------------------|----------------------------|
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007778 : p.Trh1025Ile | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007781 : p.Val1047Ala | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007782 : p.Pro1150Ser | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007796 : p.Ala1708Glu | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007799 : p.Met1775Arg | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020679 : p.Glu10Lys   | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020680 : p.Glu23Lys   | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020683 : p.Asp749Tyr  | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020690 : p.Ser1187Ile | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020691 : p.Gln1200His | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020692 : p.Arg1204Ile | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020693 : p.Lys1207Asn | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020695 : p.Ser1217Tyr | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_063212 : p.Met1775Lys | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_075666 : p.Arg1699Trp | DI-02602:Breast cancer     |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_020896 : p.Pro47Ala   | DI-02602:Breast cancer     |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_020900 : p.Met299Ile  | DI-02602:Breast cancer     |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_007757 : p.Cys61Gly   | DI-01655:Ovarian cancer    |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020702 : p.Cys1697Arg | DI-01655:Ovarian cancer    |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_075666 : p.Arg1699Trp | DI-01655:Ovarian cancer    |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020679 : p.Glu10Lys   | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020680 : p.Glu23Lys   | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020690 : p.Ser1187Ile | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020691 : p.Gln1200His | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020695 : p.Ser1217Tyr | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020696 : p.Phe1226Leu | DI-01559:Breast-ovarian ca |
| BRCA1 (P38398) :breast cancer 1, early onset  | VAR_020697 : p.Phe1243Gly | DI-01559:Breast-ovarian ca |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_023700 : p.Gln255His  | DI-01603:Fanconi anemia o  |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_023702 : p.Ala349Pro  | DI-01603:Fanconi anemia o  |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_023703 : p.Trp647Cys  | DI-01603:Fanconi anemia o  |
| BRIP1 (Q98X63) :BRCA1 interacting protein C-t | VAR_023704 : p.Arg707Cys  | DI-01603:Fanconi anemia o  |

Connected



MyGNUHealth 2.0rc1

HOME Menu

Date 26 9 2023 Time 12 35

Genotyping test

Domain & Context **medical** genetics

|             |            |        |
|-------------|------------|--------|
| rs397508635 | CFTR       | P13569 |
| p.Ser13Phe  | VAR_000101 | LP/P   |

Cystic fibrosis (CF) [MIM:219700]

pecific natural variant information by entering the reference seq ID . Once it finds a match on the information is automatically shown. Some of the information shown contains the gene symbol, acid change, natural variant ID, the category (likely benign or pathogenic) and the MIM identifier.

Relevance **important** Private page:

Save

MyGNUHealth 2.0rc1

HOME Menu

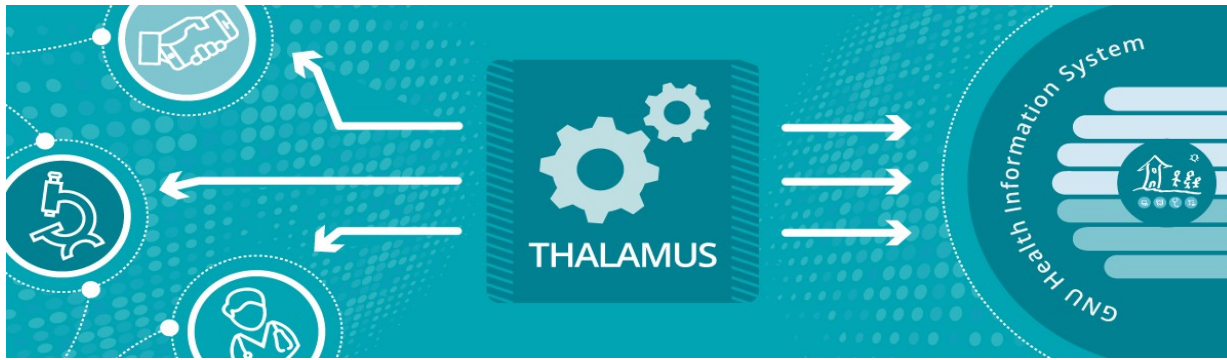
Personal key

Sign in

MyGNUHealth  
The GNU Health Personal Health Record

# Syncing pages to GH Federation via Thalamus

```
DEBUG ] [https://federation.gnuhealth.org:8443 "POST /pols/ESPGNU777ORG/4d745869-9748-417c-9391-898fe18337c1 HTTP/1.1" 200 5
Page successfully sent to the GH Federation 200
Setting fsynced to True on page... 4d745869-9748-417c-9391-898fe18337c1
```



Nodes

Message Server

Information System



Mozilla Firefox

federation.gnuhealth.org:8443 x thalamus.rst x +

https://federation.gnuhealth.org:8443/pols/ESPGNU777ORG 133%

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```
node: "mygnuhealth"
page: "f53bf492-b04f-4aeb-889f-97921eeae502"
page_date: "2023-09-27T06:42:52.078358"
privacy: null
relevance: null
summary: null
76:
  0:
    age: null
    author: "ESPGNU777ORG"
    author_acct: "ESPGNU777ORG"
    book: "ESPGNU777ORG"
    context: "self_monitoring"
    creation_info:
      node: "mygnuhealth"
      timestamp: "2023-09-30T08:10:14.035066"
      user: "ESPGNU777ORG"
      domain: "medical"
      fsynced: true
      genetic_info: null
      id: "4d745869-9748-417c-9391-898fe18337c1"
      info: "Happy at GHCON and OrthancCON 2023"
    measurements:
      0:
        mood_energy:
          energy: 2
```



# Syncing pages to GH Federation via Thalamus

```
DEBUG ] [https://federation.gnuhealth.org:8443 "POST /pols/ESPGNU777ORG/4d745869-9748-417c-9391-898fe18337c1 HTTP/1.1" 200 5
Page successfully sent to the GH Federation 200
Setting fsynced to True on page... 4d745869-9748-417c-9391-898fe18337c1
```

MyGNUHealth 2.0.0

I am feeling...

Mood

Energy

Happy at GHCON and OrthancON 2023

DONE

MyGNUHealth 2.0.0

HOME Menu

Federation Key

|                          |                           |   |
|--------------------------|---------------------------|---|
| 06:42                    | medical (self_monitoring) | having dinner outside                                     |
| Wed, Sep 27 '23<br>06:42 | medical (self_monitoring) | Blood glucose: 82 mg/dl<br>having dinner outside          |
| Wed, Sep 27 '23<br>06:42 | medical (self_monitoring) | osat: 99 %<br>having dinner outside                       |
| Sat, Sep 30 '23<br>08:10 | medical (self_monitoring) | mood: 1<br>energy: 2<br>Happy at GHCON and OrthancON 2023 |

Mozilla Firefox

federation.gnuhealth.org:84 x thalamus.rst

https://federation.gnuhealth.org:8443/pols/ESPGNU777ORG 133%

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```
node: "mygnuhealth"
page: "f53bf492-b04f-4aeb-889f-97921eeae502"
page_date: "2023-09-27T06:42:52.078358"
privacy: null
relevance: null
summary: null
76:
  0:
    age: null
    author: "ESPGNU777ORG"
    author_acct: "ESPGNU777ORG"
    book: "ESPGNU777ORG"
    context: "self_monitoring"
  creation_info:
    node: "mygnuhealth"
    timestamp: "2023-09-30T08:10:14.035066"
    user: "ESPGNU777ORG"
    domain: "medical"
    fsynced: true
    genetic_info: null
    id: "4d745869-9748-417c-9391-898fe18337c1"
    info: "Happy at GHCON and OrthancON 2023"
  measurements:
    0:
      mood_energy:
        energy: 2
```

# MyGNUHealth nodes in the GH Federation



## Highlights

Every person is a node

Realtime update with her health professional

Person is in control of what to share

Decrease the burden in the public health system

The person is now an active member in the public health system

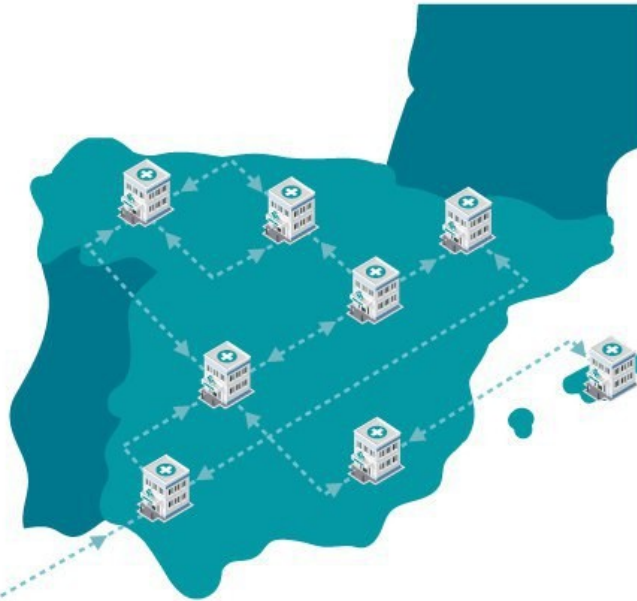
# Benefits of a Libre Public Health Network

## Unique ID & history

Person demographics and **medical history up-to-date** no matter the health institution she goes across the country

## Improve quality of care

Health professionals have better and timely patient information. Saving time and providing better healthcare



**Libre Software:** No hidden code, no blackboxes in healthcare.

The health software will be a **public good**.

**Save millions of euros** in licenses that can go to improve the public health system.

## Empower the community

The person is now an active player in the system of health



# Real-time observatory and reporting



<https://www.gnuhealth.org/join>

Thank you  
for being part  
of GNU Health!



# Happy Hacking!

