

SYNDESIS

Intelligence in Health and Welness

Designing Smart Home Environments for Unobtrusive monitoring for healthier lives: the use cases of USEFIL and REAAL

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NCSR Demokritos

Global Summit on

Telemedicine & eHealth

August 17-18, 2015 Houston, Texas, USA

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  - REAAL
- Innovative approaches for Telemedicine and eHealth

Who we are - Greek Leading Research Center

National Center For Scientific Research "Demokritos" www.demokritos.gr is a multi-disciplinary Research Centre, with research activities in the field of physical sciences and significant laboratory infrastructure.

- Total number of staff : 700 (Scientific personnel and full time high qualified Researchers)
- Graduate students and post-doc researchers: 180

NCSR consists of five institutes and the Division of Applied Technologies:

Institute of Informatics and Telecommunications

Institute of Biosciences and Applications

Institute of Nuclear & Radiological Sciences & Technology, Energy & Safety

Institute of Nanoscience and Nanotechnology

Institute for Nuclear and Particle Physics

Division of Applied Technologies

Who we are - Greek Leading Research Center

Mission of the Institute of Informatics and Telecommunications and the Division of Applied Technologies***:***

Connect society, business-innovation and research

•Transform research results into tangible commercial innovation opportunities.

•Generate new products and services responding both to public demand and to the needs of the knowledge economy.

•Enhance new research perspectives stressing interdisciplinary approaches in areas with strong societal and economic importance.

•Commercialize (spin of) the most up-to-date and relevant research findings, potentially giving advantage in the latest technological fields.

Who we are – Spin Off Company

HOME ABOUT PRODUCTS AND SERVICES CASE STUDIES CONTACT



SYNDESIS

Intelligence in Health and Welness

CONTACT



B2C : Web2.0 for health and wellness

- Electronic health and wellness services (ehealth) to end users-cutomers in collaboration with affiliated diagnostic centers and private practitioners.
- Care Services (assistive living) distance to end-users using online systems and television



R&D

Develop non-invasive diagnostic tools using bio-monitoring tools and ehealth services to detect CVD diseases such as Coronary Artery disease.

We are using a 3 tier solution by daily monitoring: nutrition, health vital signs and activity.

Our long term objective is to provide health tests that can help find health problems early, when the chances for treatment and cure are better.



B2B: Hosting and maintenance of "Virtual ehealth Operators"

Potential target customers among the others are:

- Insurance companies for the creation and support of their insurance products
- Maritime and Transportation companies
- Fitness companies and gyms
- Large Hotels,
- Hospitals and clinics



Knowledge Management

- Professional elearning services to end users such as businesses and organizations in the health and care as well as medical, nursing and care staff
- Usie of online games, serious games and game mechanics to enhance eLearning services

www.syndesis.eu

Through E.U. funded projects an integrated network supporting advanced applications in the field of telemedicine ensuring the interoperability between wireless and terrestrial segments of the network has been developed.

This medical network interconnects hospitals using advanced terrestrial and wireless technologies.

The network is being developed and expanded more utilising advanced technologies.

Telemedicine via Integrated Networks (indicative projects)

1. The Intermed Network

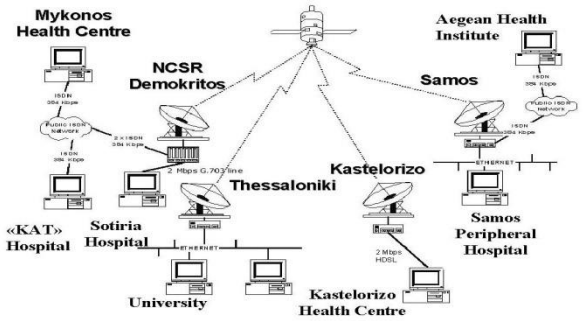
2. The GALENOS Network

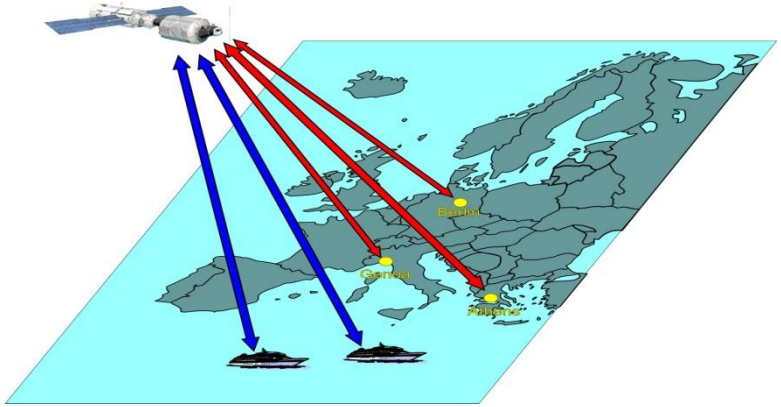
3. The Grundvig project

4. The Tillelpokratis Network

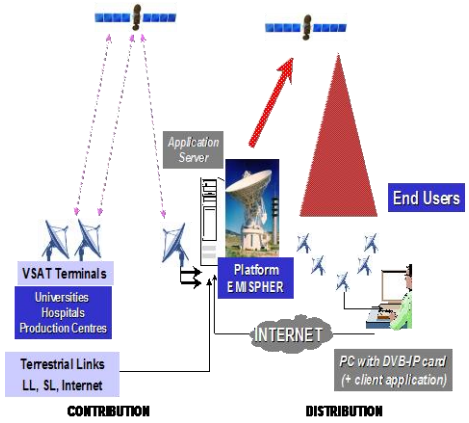
Who we are – 20 Years of innovative Projects in Telemedicine and eHealth

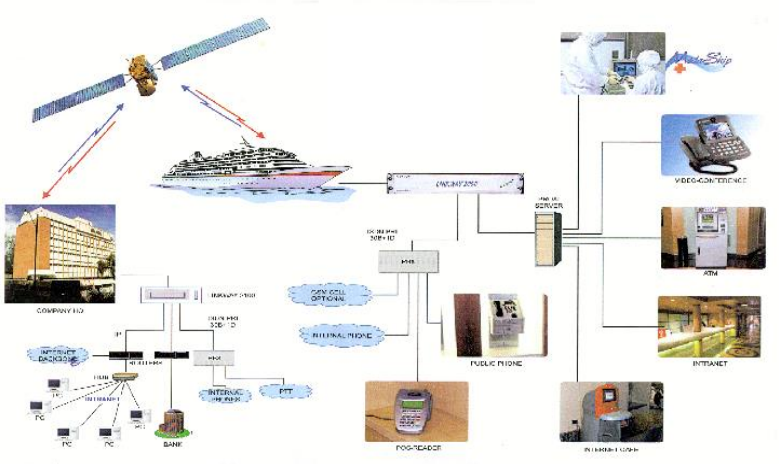
We have developed an integrated satellite and terrestrial network and cloud based hosting infrastructure supporting advanced applications in the field of telemedicine and eHealth ensuring the provision of advanced eHealth services.

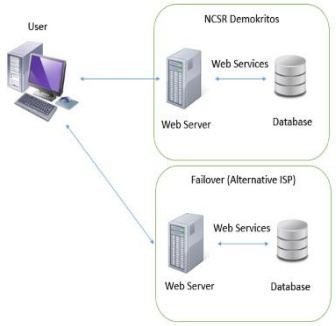








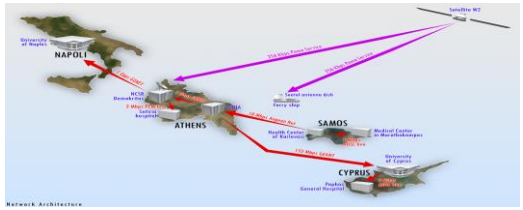




Web hosting in our premised

Who we are - 20 Years of innovative Projects in Telemedicine and eHealth

Telemedicine and Home care:We have implemented the pilot sites within the Island of Samos, Hios and Cyprus (Hospital of Nicosia).







Medical center in Karlovasi







We have developed and tested the services within : Intermed and Tile-Ippokratis projects



Rural medical center in Marathokampos

Who we are - 20 Years of innovative Projects in Telemedicine and eHealth

We have experimented with state of the art monitoring devices (wireless - ease of use) and we have developed web interface open to many devices / vital signs.

The above services have already been successfully applied in rural areas. These test cases have provided to us useful data concerning the technical operational status of the whole system.



ECG

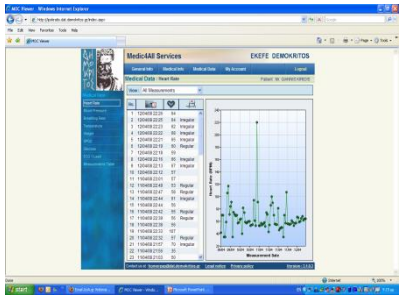


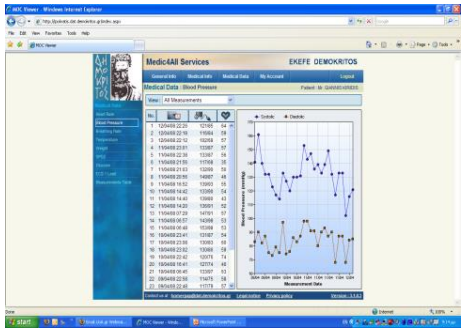
Wireless Weight



Alarm Button-HR

First Simple Web Presence



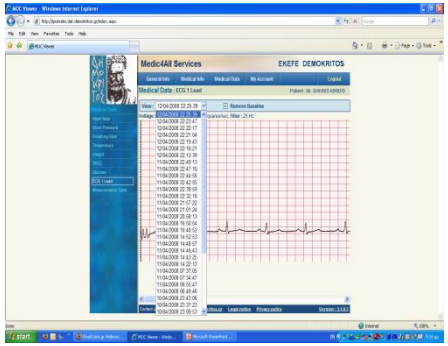


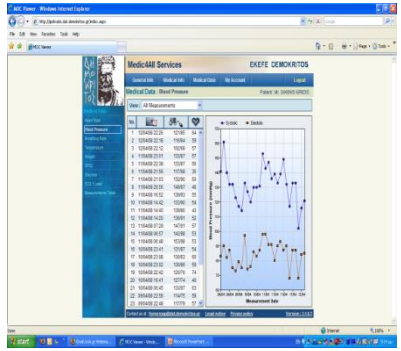




Multi-monitoring







Home care scenario

Telemedicine and eHealth in Homecare

Consultation service



Home





Basic Telemedicine service

Transfer of Data

Telemedicine and eHealth in Homecare – Target Groups

Who actually needs this service?





Chronic Patients









Rural Areas

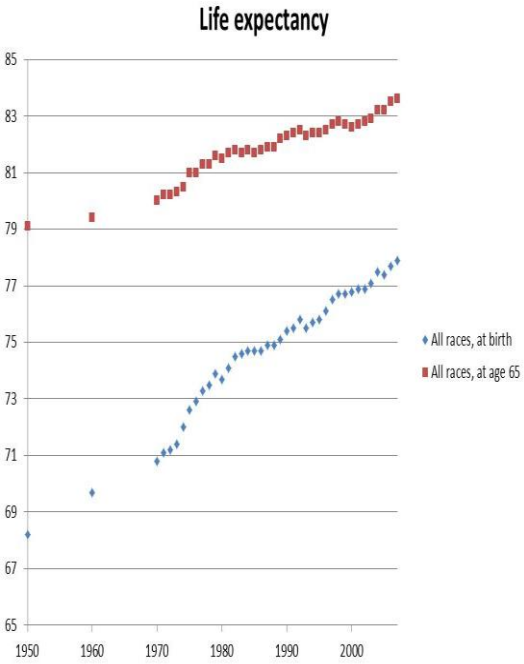


Elderly People

Telemedicine and eHealth in Homecare – Ageing: A promising Target Group



All of us….in a few years time



"Ageing" costs in healthcare system

Rapidly growing elderly population in key markets

Our time : Less Money



Facts and comparisons

Telemedicine and eHealth in Homecare – ICT ecosystem is booming



Sensing technology:Smart Activity Trackers



Speeeeeed



Biosensors technology



Ecosystems for monitoring and managing personal data

BODYMEDIA FIT
RunKeeper
myfitnesspal
Lose It!
tactio
TargetWeight
digifit

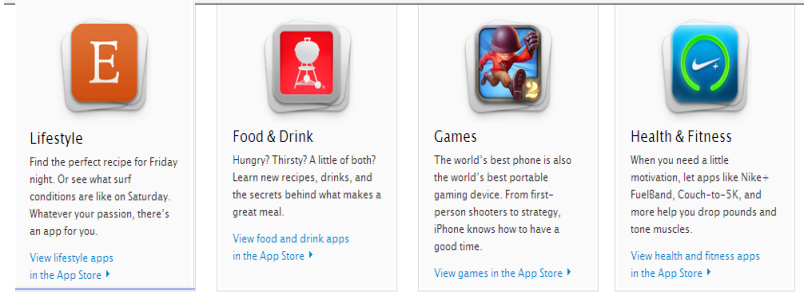
Hundreds of health and relevant sites



Wearables : smart watch



Social Media



Apps Apps Apps Apps Apps



Intelligence

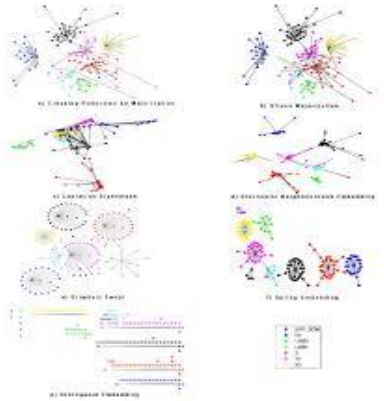
Running projects

USEFIL
Unobtrusive Smart Enviroments For Independent Living









ProFouND
Prevention of Falls Network for Dissemination



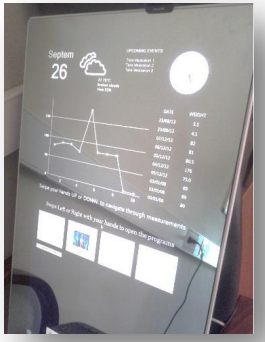
COncORDE



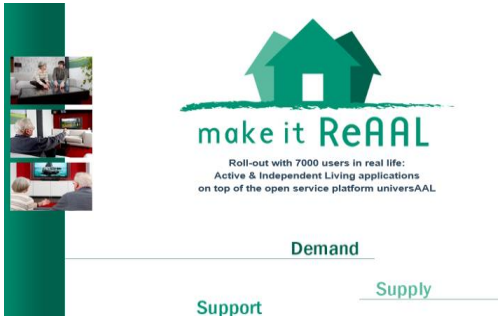


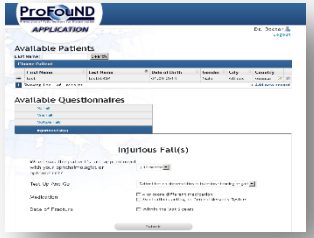
Data : Personal Record

Intelligence

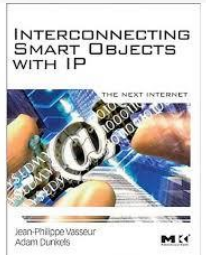


IoT









Running Projects

Running projects- USEFIL

What we are trying to do?



Sensing technology: Smart Activity Trackers



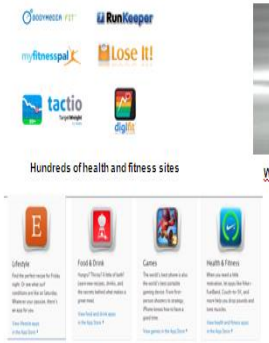
Speeeeeed



Biosensors technology



Ecosystems for monitoring and managing personal data



Hundreds of health and fitness sites

Apps Apps Apps Apps Apps



Wearables : smar watch

ICT Ecosystem



Gap





<u>Needs</u> of the elderly people

We are <u>not inventing</u> new fancy systems.

We are just trying to <u>exploit</u> the ICT Ecosystem for the benefit of the Elderly people.

Running projects- USEFIL

The most commonly quoted definition of health : “a complete state of **physical**, **mental** and **social well-being**, and not merely the absence of disease or infirmity.”

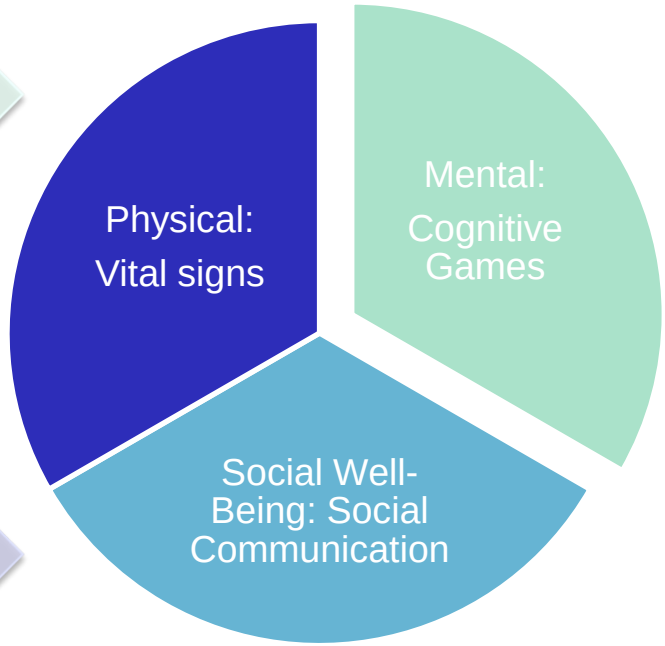
http://www.who.int/bulletin/bulletin_board/83/ustun11051/en/

Ease of use Services

- Automated monitoring
- Unobtrusive monitoring
- Easy Access to technology
- Personalized services

Useful Services

- Support Social activities
- Support mobility
- Use Low cost systems



Determinants of our services

Running projects- USEFIL

- Interfaces
  - a Slate-tablet PC
  - a Web-TV (TP-Vision) in the living room





- Sensors
  - a wrist watch
  - a Depth camera (living room)
  - mic and camera on the Slate-tablet PC
  - mic and camera behind a mirror







- Processing Power for homePC
  - a nettop pc / laptop





We exploit low cost systems

Running projects- USEFIL

- Web-TV:
  - To deliver content from other computers or storage devices on the network.
  - To provide access to internet-based services including traditional broadcast TV channels, catch-up services, video-on-demand, interactive advertising, personalisation, voting, games, social networking.



- Low-cost / Low power consumption hardware:
  - Nettops (e.g.Zbox ID80), USB-sized (FXI Cotton Candy)
  - Kinect / Asus Xtion
  - Cameras





- Unobtrusiveness:
  - No wires
  - blending with common furniture
  - cameras behind mirrors



Running projects- USEFIL

- Slate Tablet:
  - Tablets running open-source OS that allow for peripheral connection
  - Smartphone apps make easier the connection to a social net by elderly users
  - bigger screens make use of apps much easier



- Wrist watch:

wearable multi-sensor data logging device

recording activity, accelerometer, galvanic skin response, skin temperature and ambient temperature



i'm Droid. The operating system tailored on i'm Watch

Running projects- USEFIL

Three Directions of monitoring

1. Functional Status: How well can the elderly perform activities of daily living independently?



2. Emotional Status: How does the elderly feel when living alone:

- certain emotions can indicate health problems
- some emotions can even be mental health problems



3. Physiological Status: What are his/her health signs?

- Heart Rate
- Breathing Rate
- Pupil size
- Face Color

... + (Ideally) Blood Pressure



•We use common hardware with minimum effort from the user

•everyday, long-term monitoring

Running projects- USEFIL

We tried to embed Intelligence

Sensor Input

Data Fusion

Low/high level events

DSS Subcomponents

- Core modules for decision support
- Long-term analysis
- Risk prediction and assessment
- Lifestyle modifications' suggestion

DSS Output

Alarms/notifications:

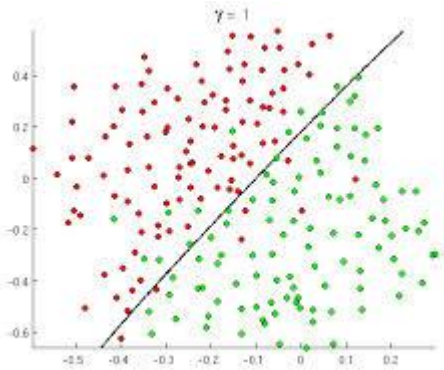
- Health risks
- Identify trends
- Detection of transition from a healthy status to a pathological one

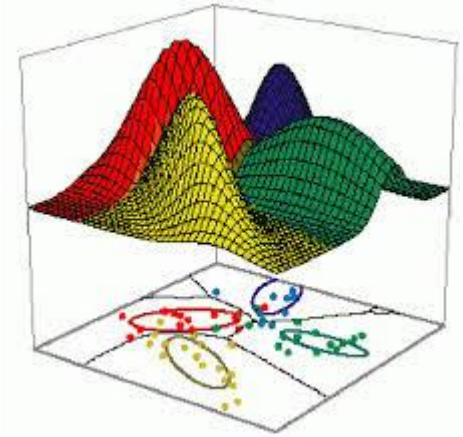
Suggestions/prompts:

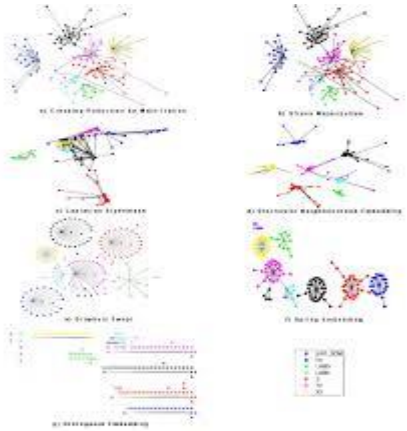
- Lifestyle recommendations

USEFIL Apps

- Recommendation App
- Alerting App



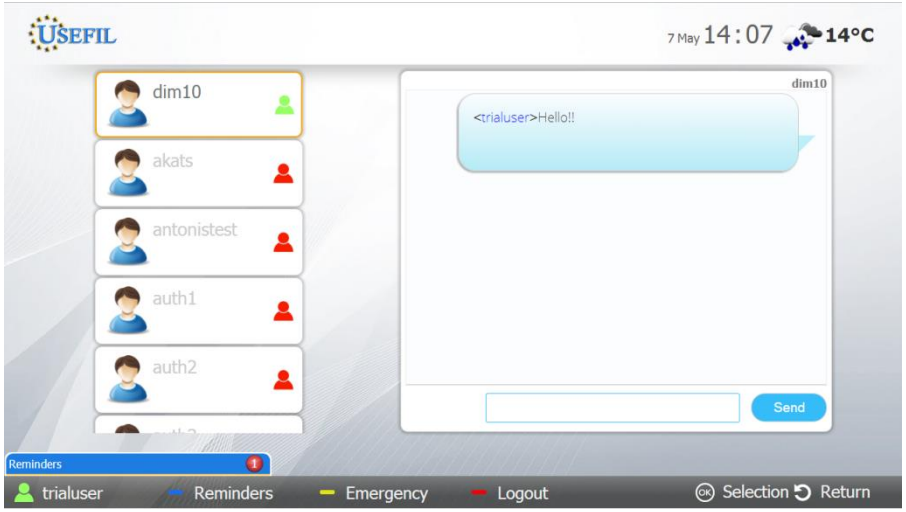


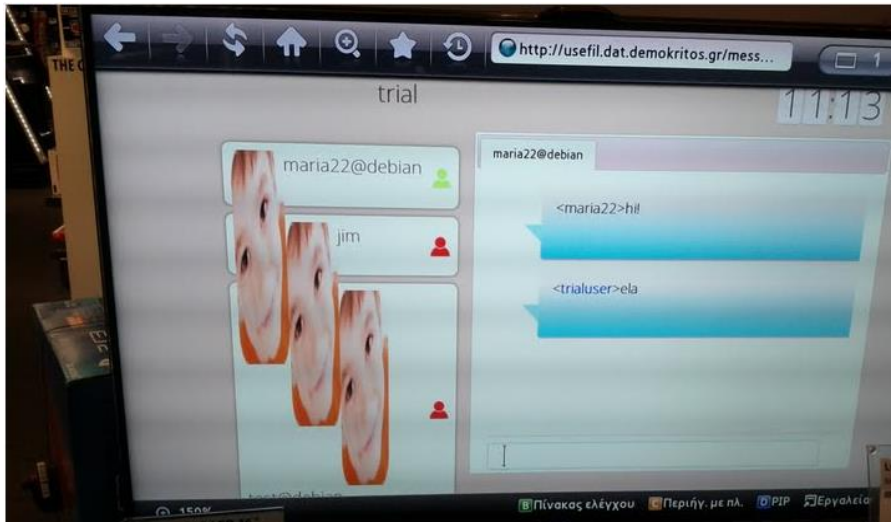


We use Machine learning techniques to diagnose, predict and monitor

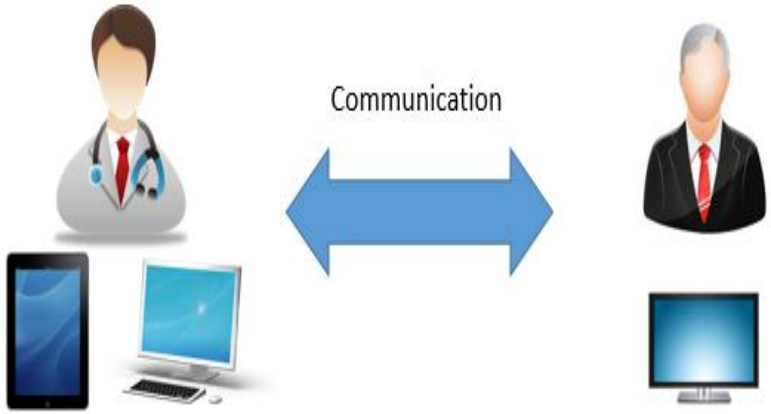
Running projects- USEFIL

We keep people connected:









Running projects- USEFIL





Web Portal





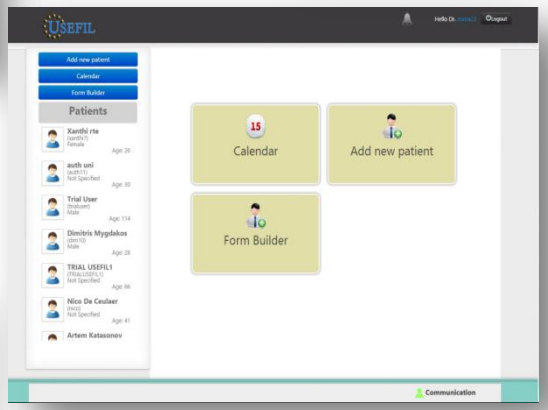


Family Access



Elderly profile

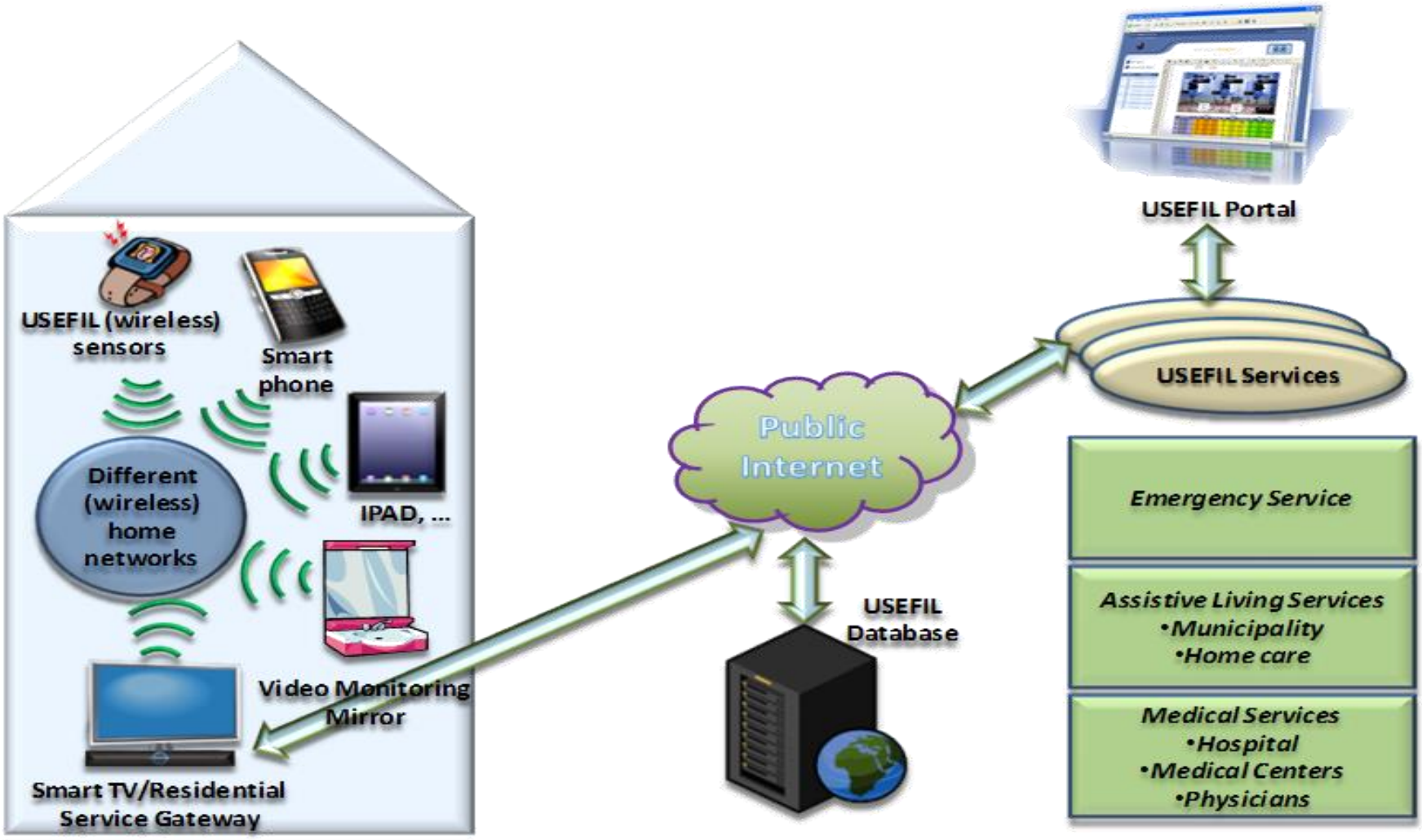




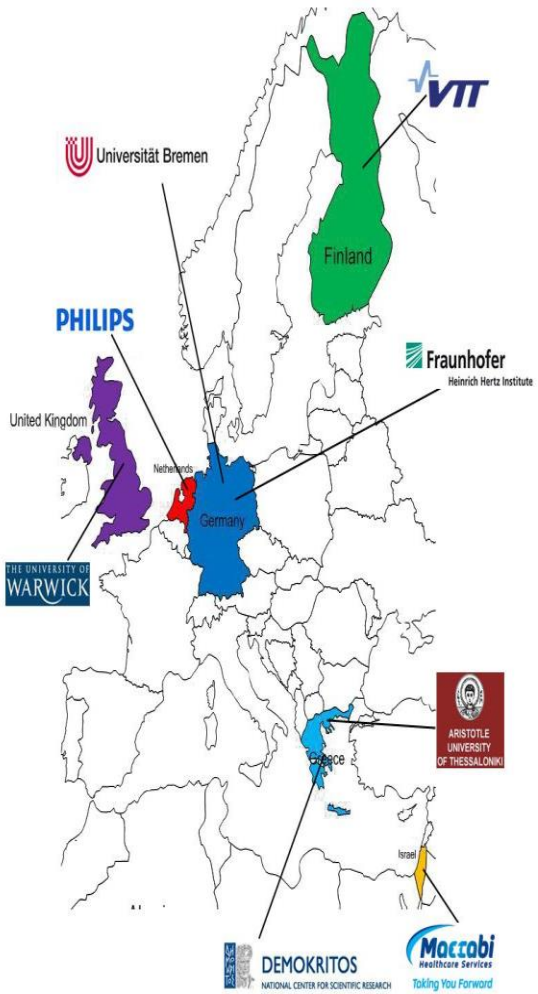
Doctors access

Running projects- USEFIL

Architecture Design : Web based



Running projects- USEFIL



The target population in Israel is:

- Patients who had **stroke event** (first) and are independent and living in their home alone or with the assistance of daily operations only.

The target population in Greece is:

- Elderly participants aged 60 or older (ideally older than 65).
- Healthy individuals, patients with **mild cognitive impairment**, individuals with a propensity for sporadic bouts of mild depression.

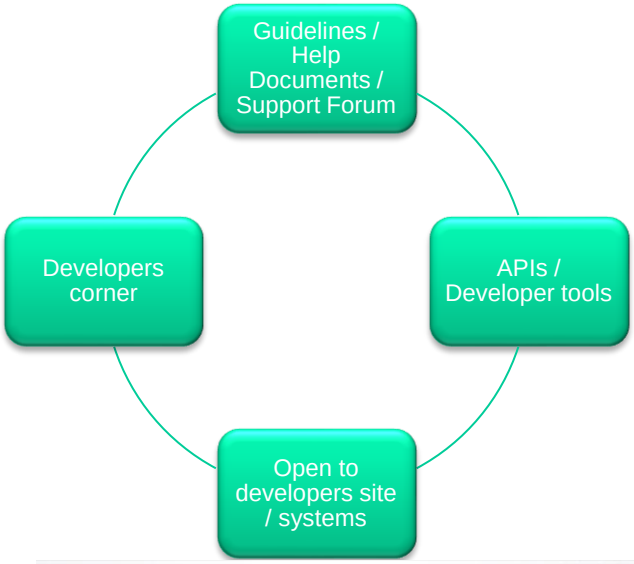
The target population in UK is:

- Elderly (>65) with **chronic conditions (co-morbidities included)** with the exclusion of any form of dementia

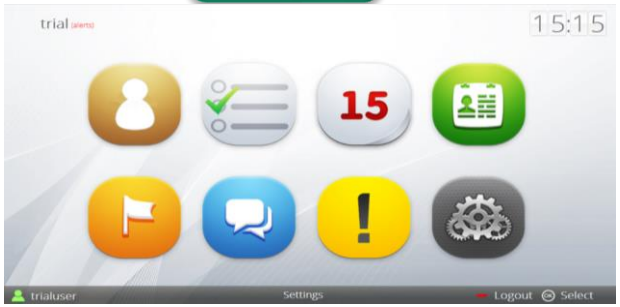
Running projects- USEFIL









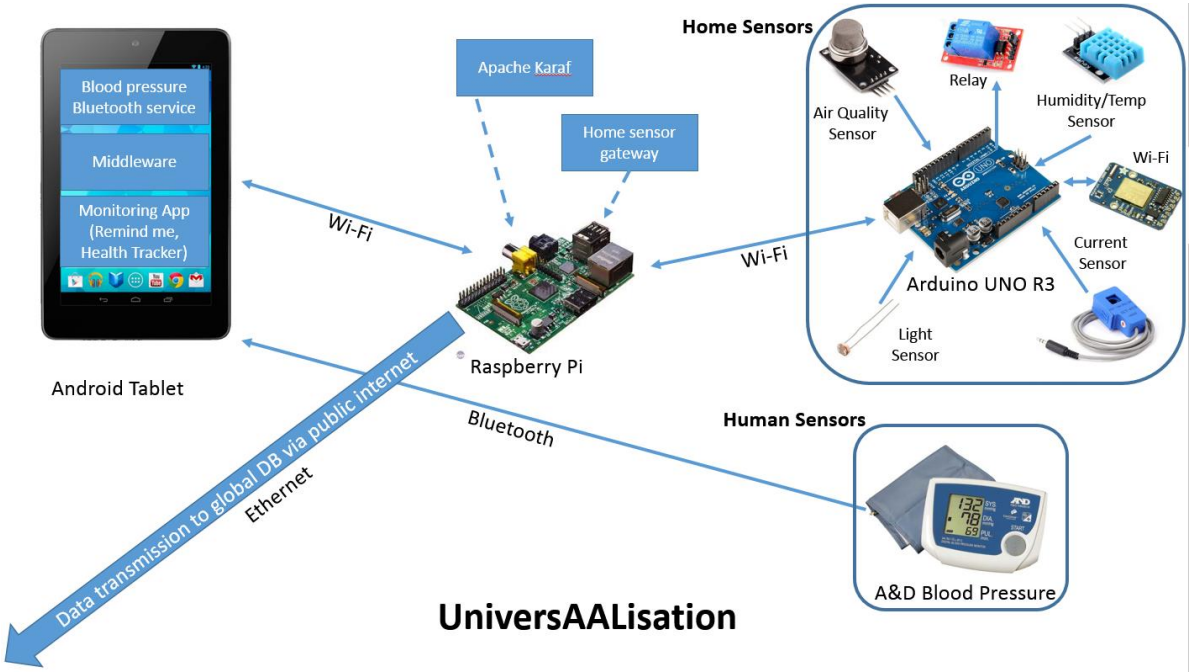


<u>We provide</u> : APIs and guidelines, platform to create and test your own apps

Running projects- REAAL



Smart Home





Web Server

We monitor : Humidity, smoke, light, Temp, CO2 and others

Medical Data:

- Blood Pressure
- Heart Rate
- Blood Oxygen Saturation
- Body Weight
- Blood Glucose

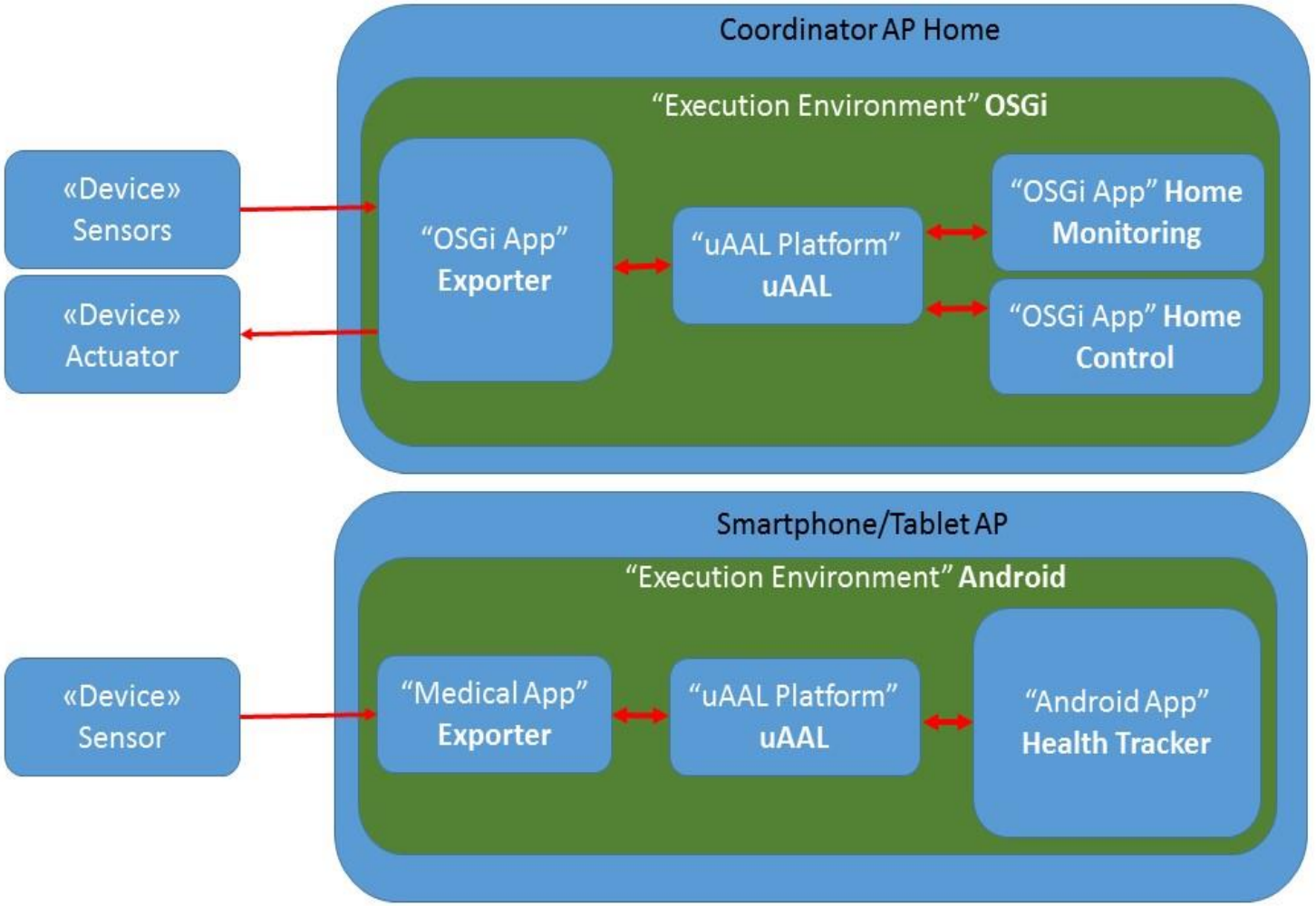
Provided Services:

- Speaker notification
- Switch Controller (e.g turn on/off home devices)

make it ReAAL

http://www.cip-reaal.eu/home/

Running projects- REAAL



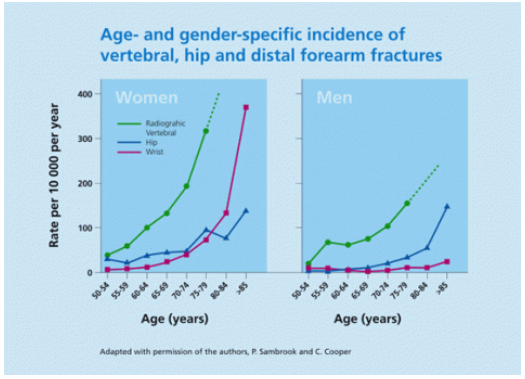
Innovative IoT and WoT platform to create advanced apps

Advantages Perceived

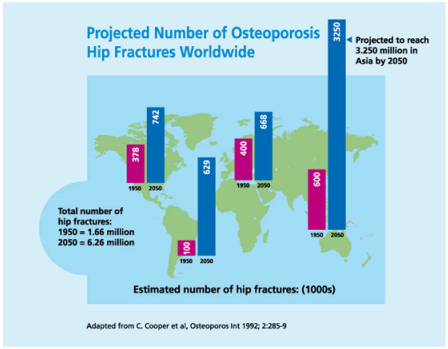
- New sensors, perhaps more advanced or suitable, can be easily integrated without much effort.
- New applications can be easily integrated in the system and extend its functionalities.
- There is the ability to trigger events e.g. an unexpected vital sign measurement will trigger the relay to act accordingly based on the specified rules.
- Ability to create lightweight applications acting as agents, responsible for small dedicated tasks.

Running projects- Profound

Identification of the Need for an App for Professionals



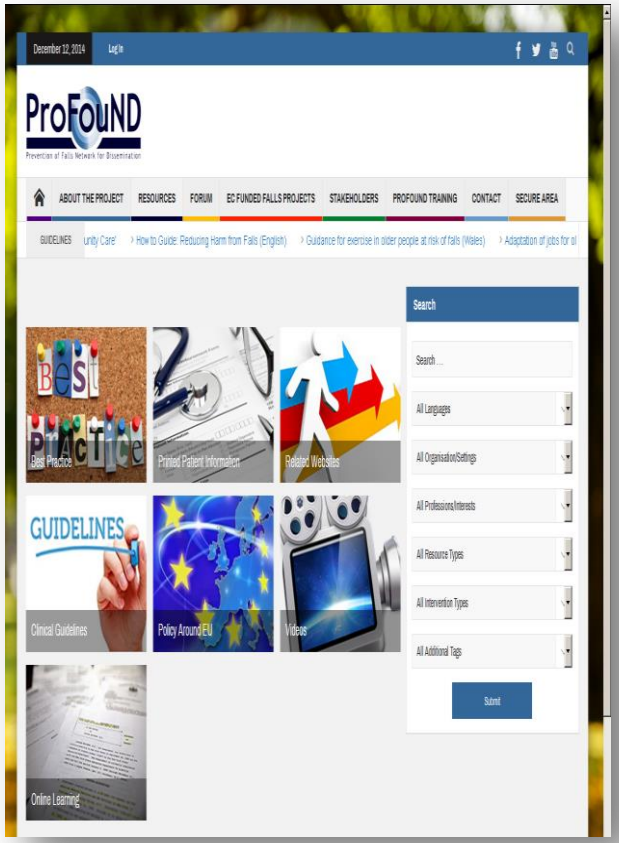
Masud, Morris *Age & Ageing* 2001; 30-S4 3-7
Rubenstein. *Age & Ageing*; 2006; 35-S2; ii37-41



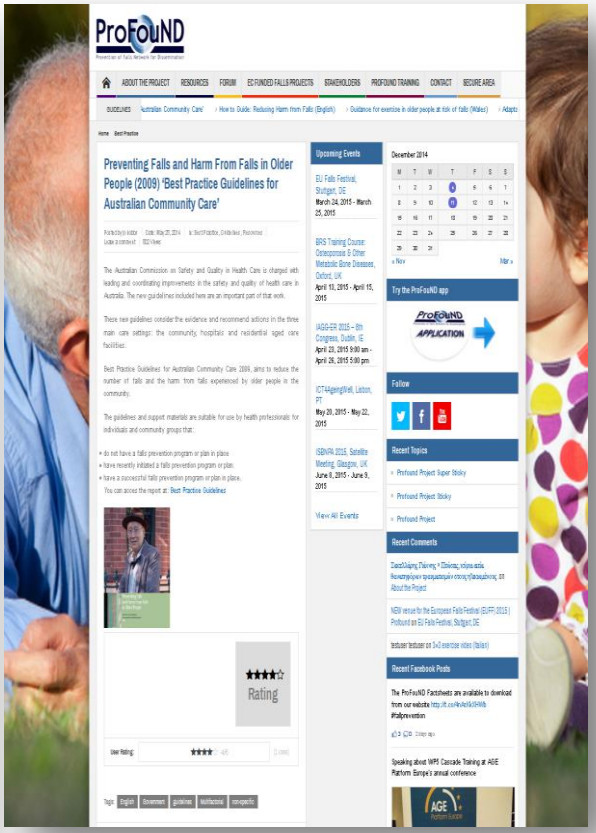
Falls can be prevented!

- 30-40% community dwelling >65yrs fall in year
  - 40-60% no injury
  - 30-50% minor injury
  - 5-6% major injury (excluding fracture)
  - 5% fractures
  - 1% hip fractures
- Falls - most serious frequent home accident
- 50% hospital admissions for injury due to fall
- <u>History of falls a major predictor of future fall</u>
- <u>Assessment of the suitable treatment is a key point for prevention of further event</u>

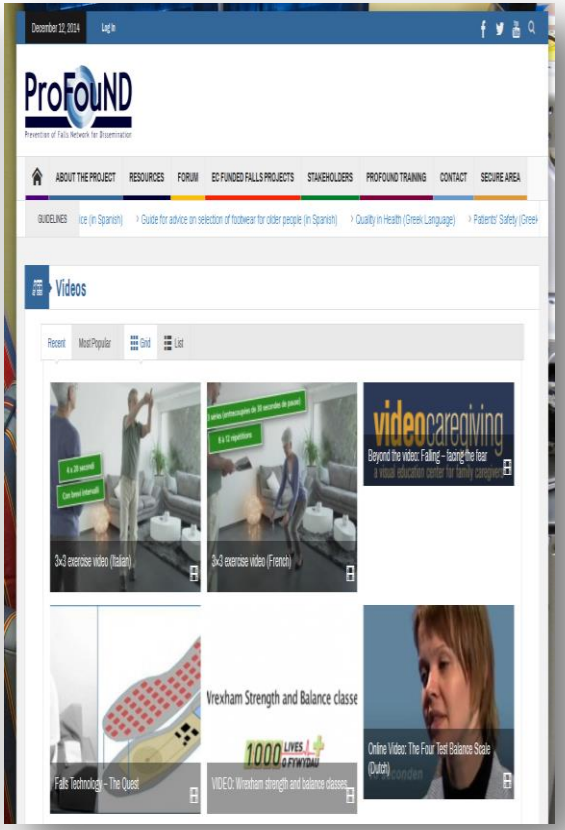
Running projects- Profound



Resources Webpage



Resource Usefulness Rating System

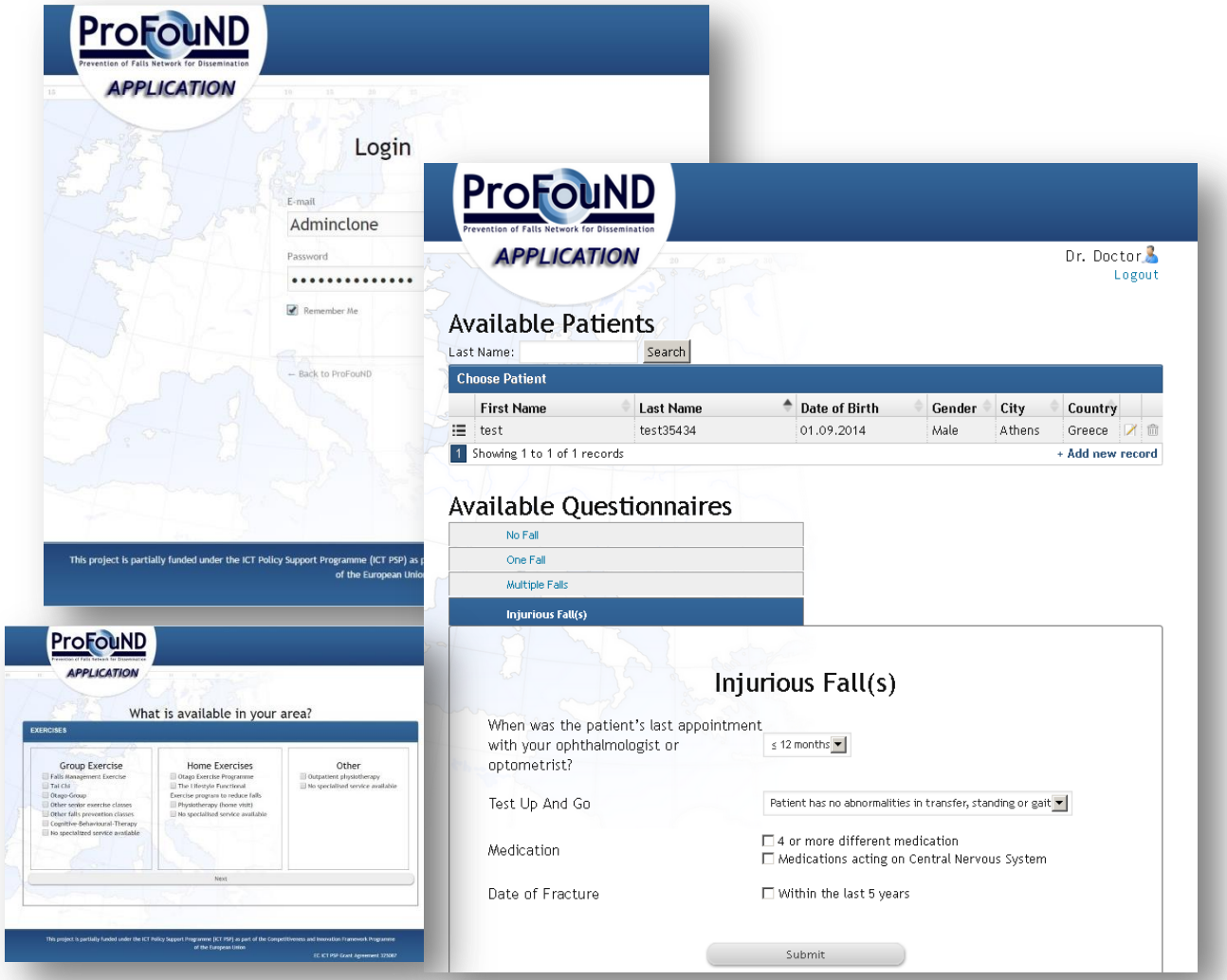


Video Resources Webpage (Most Recent/Most Popular)

Profound site www.profound.eu.com

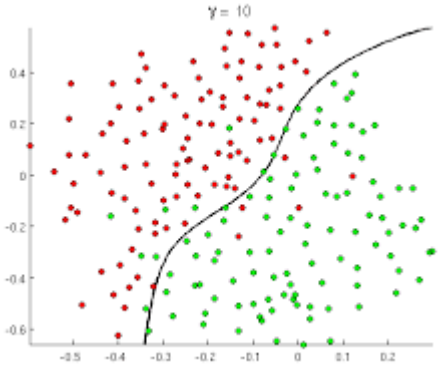
Running projects- Profound

Expert Knowledge : Profound Application



ProFouND
Prevention of Falls Network for Dissemination

Falls Prevention App



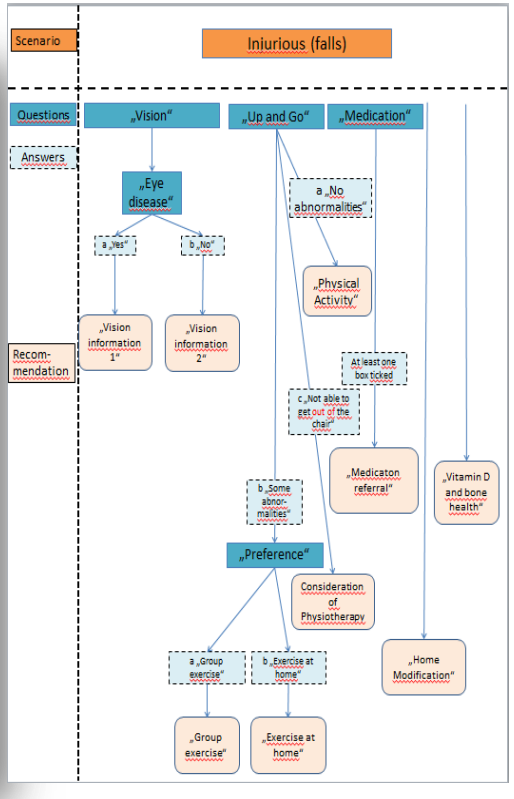
Enhance with Machine Learning Algorithms

Running projects- Profound

Intelligent Personalized Recommendations for Professionals

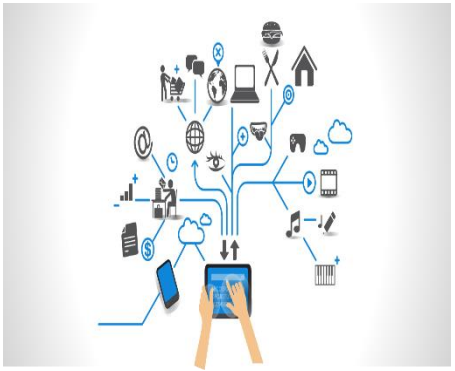






- Four scenarios were identified according to the evidence
- The App leads to different recommendations and to a personalized but reasonable prevention plan.
- The healthcare professionals defined the assessment and treatment plan that should be followed in each of the scenarios, thus leading to the production of the App's wireframes.

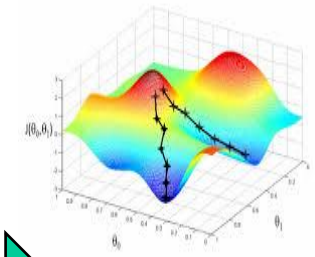
Innovative approaches for Telemedicine and eHealth –The Whole loop

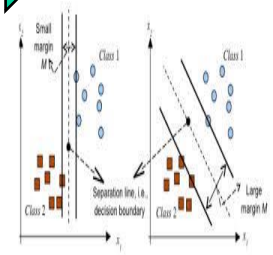


IoT – WoT - IoE



BIG ?









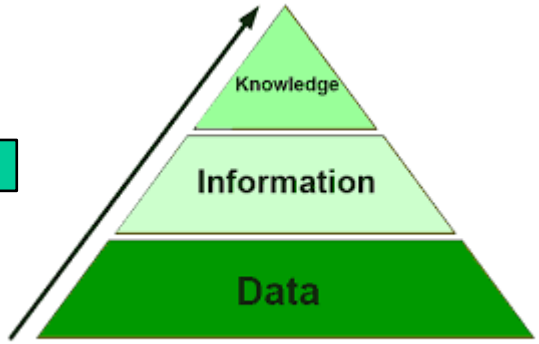
Use Intelligence



Generate Data

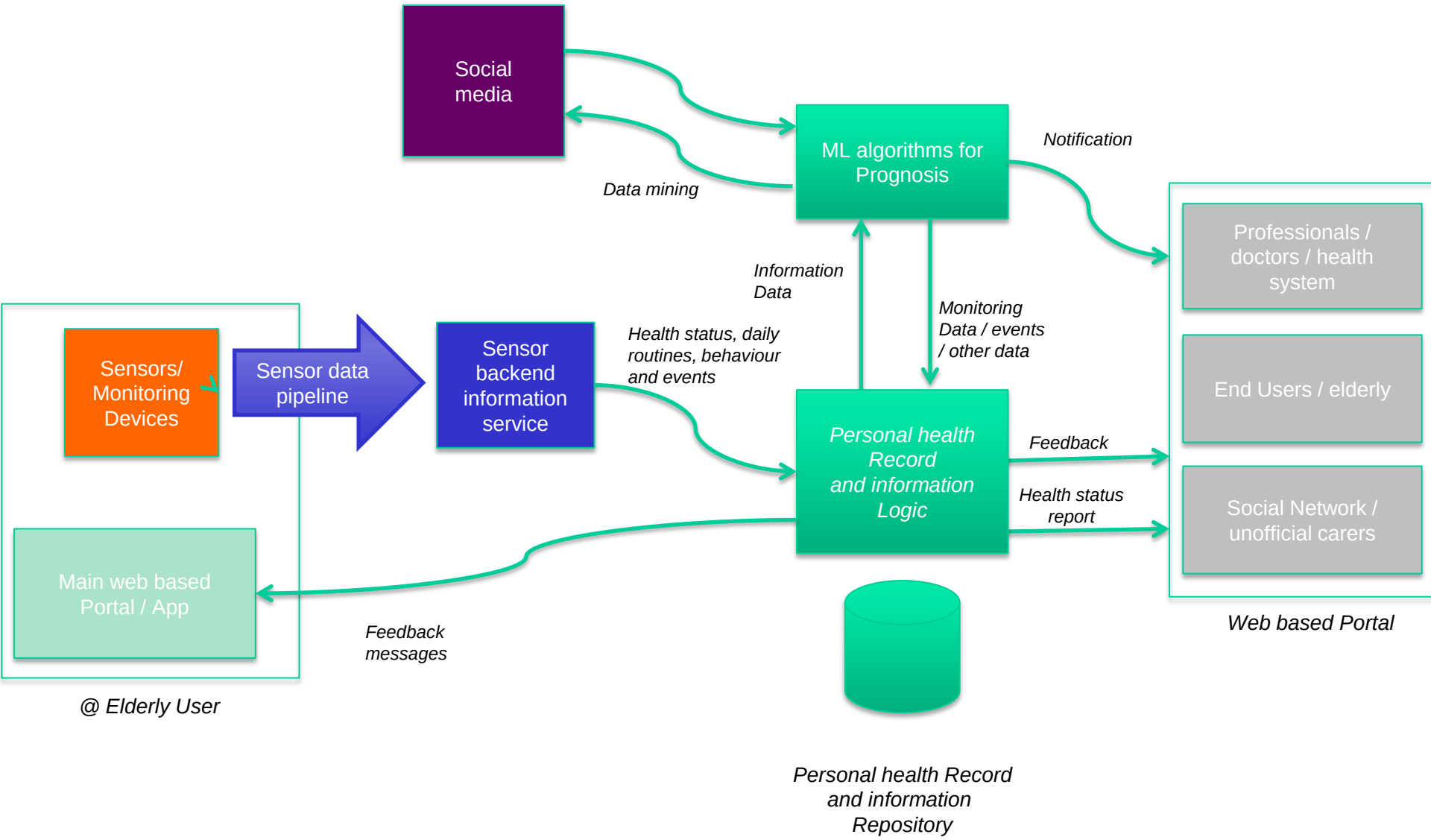


Smart Cities – Smart Homes



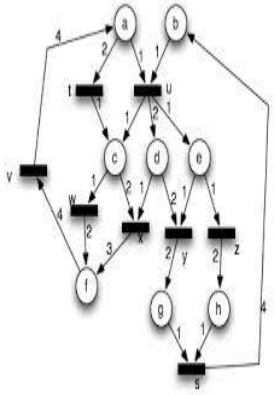
Decrease the entropy of the unstructured/ chaotic data

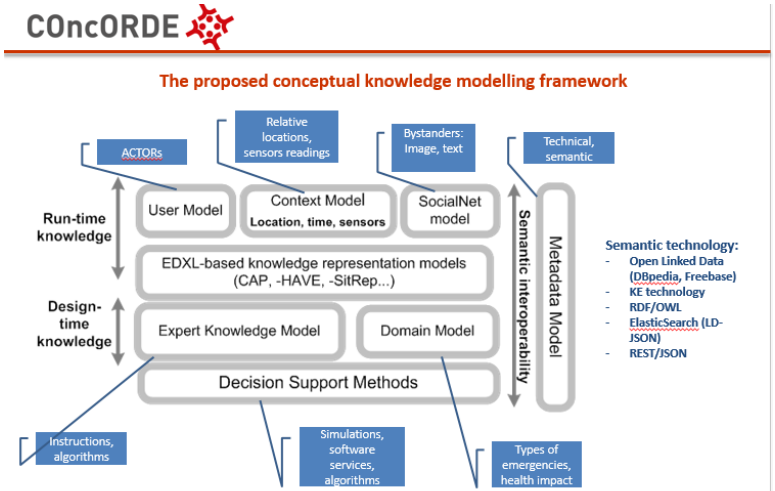
Innovative approaches for Telemedicine and eHealth-Web Architecture

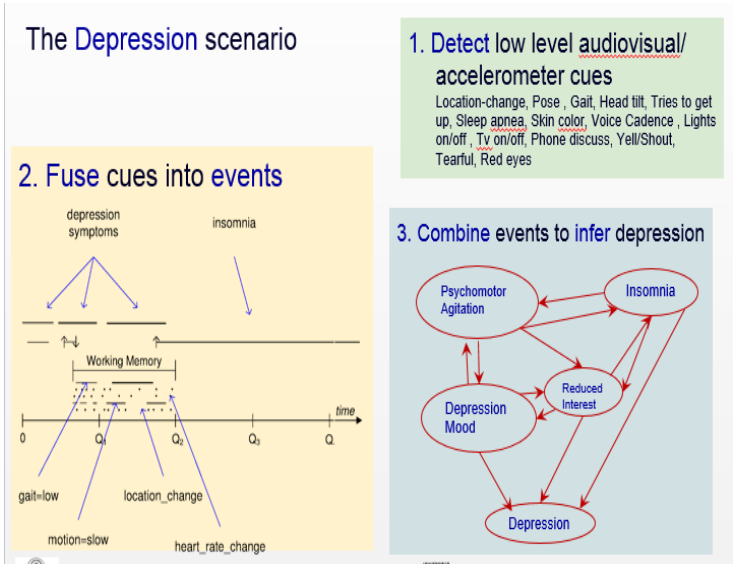


Web Based Architecture to cope with the Big Data

Innovative approaches for Telemedicine and eHealth- Intelligence







Intelligence will be embedded in ConCorde

Intelligence has been embedded in USEFIL for data fusion

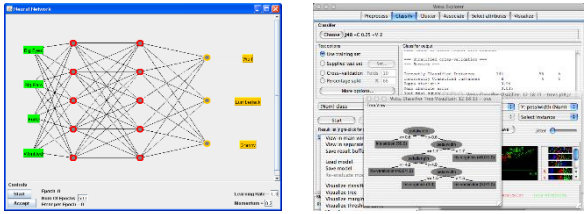
Pilot PCC with Evagelismos Hospital

- Vital signs (BP)
- Adherence behaviour
- Demographics

ReAAL pilot (60 end users)

- Vital signs
- Environmental data
- Demographics
- Adherence behaviour





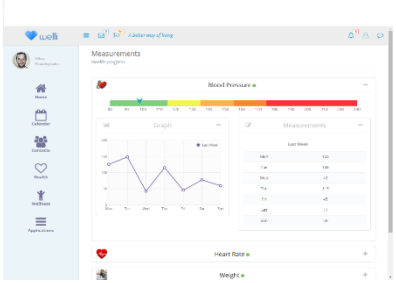
We create data sets

We create algorithms to support prediction/diagnosis

Innovative approaches for Telemedicine and eHealth – The domains

Services

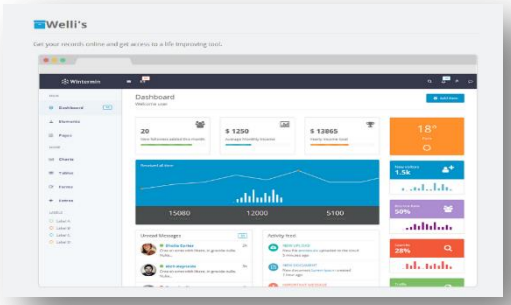




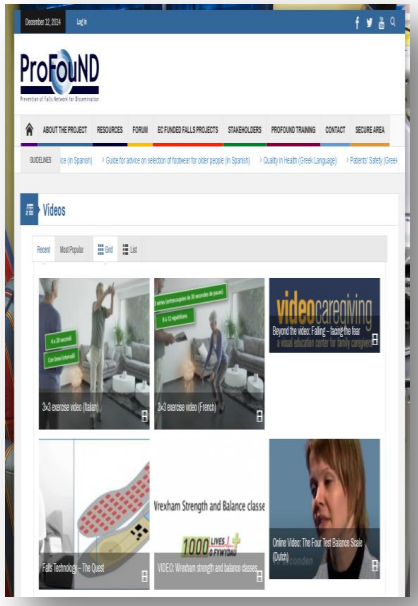
Health tracker App



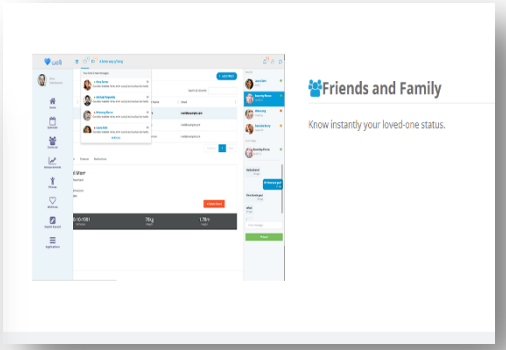
Ehealth



Well-Being



Professional Training/Support



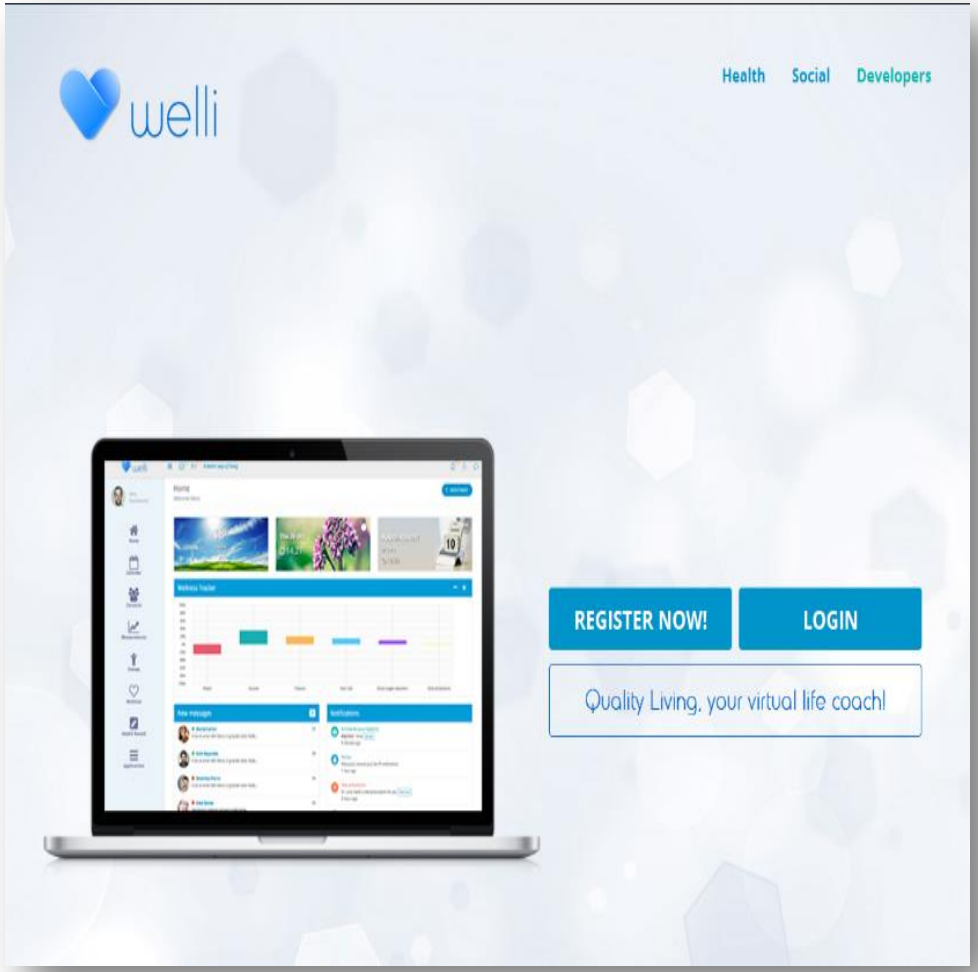
Assistive Living

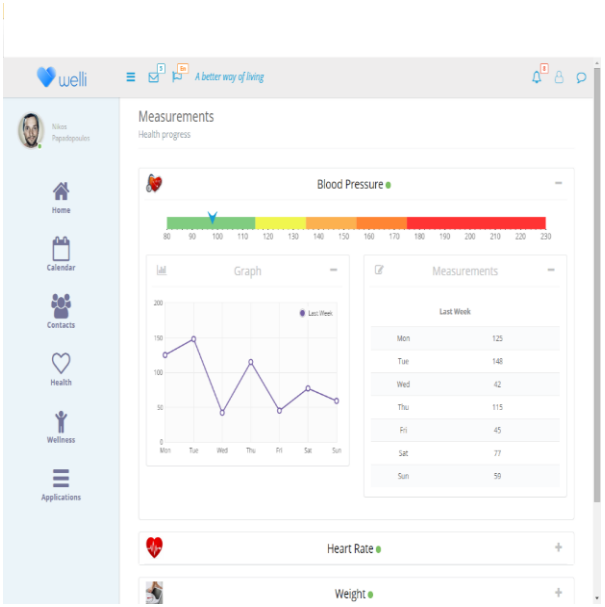


Emergency

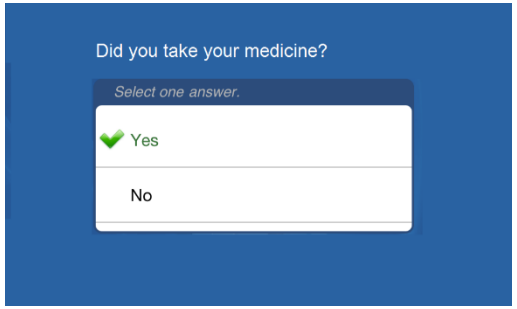
Innovative approaches for Telemedicine and eHealth – Intelligent wellness Platform

www.iWelli.com



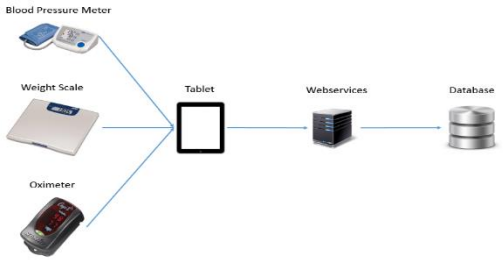


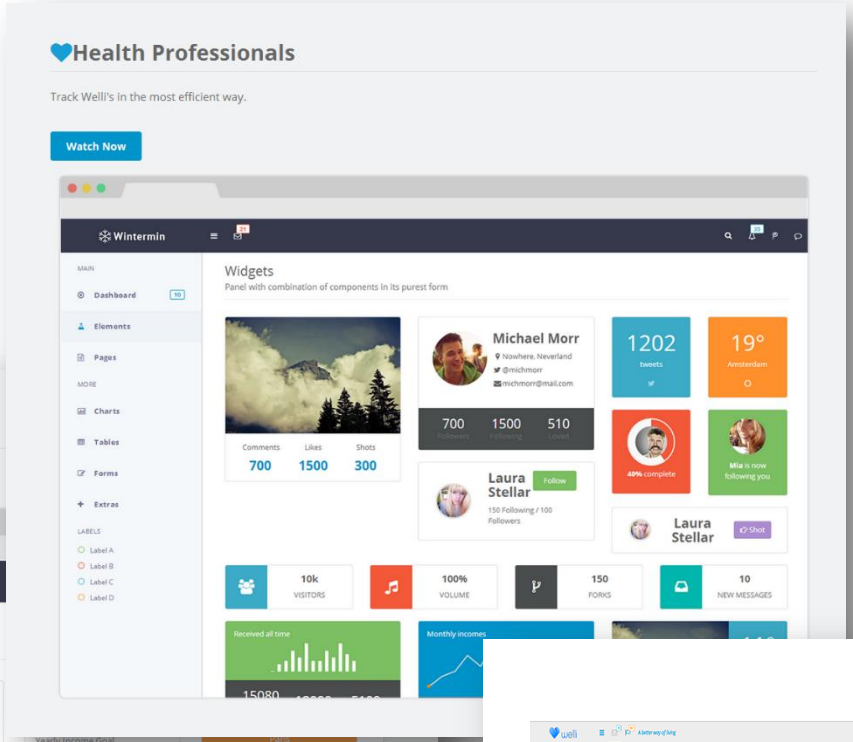
Health tracker App

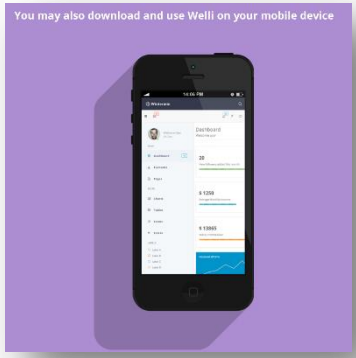


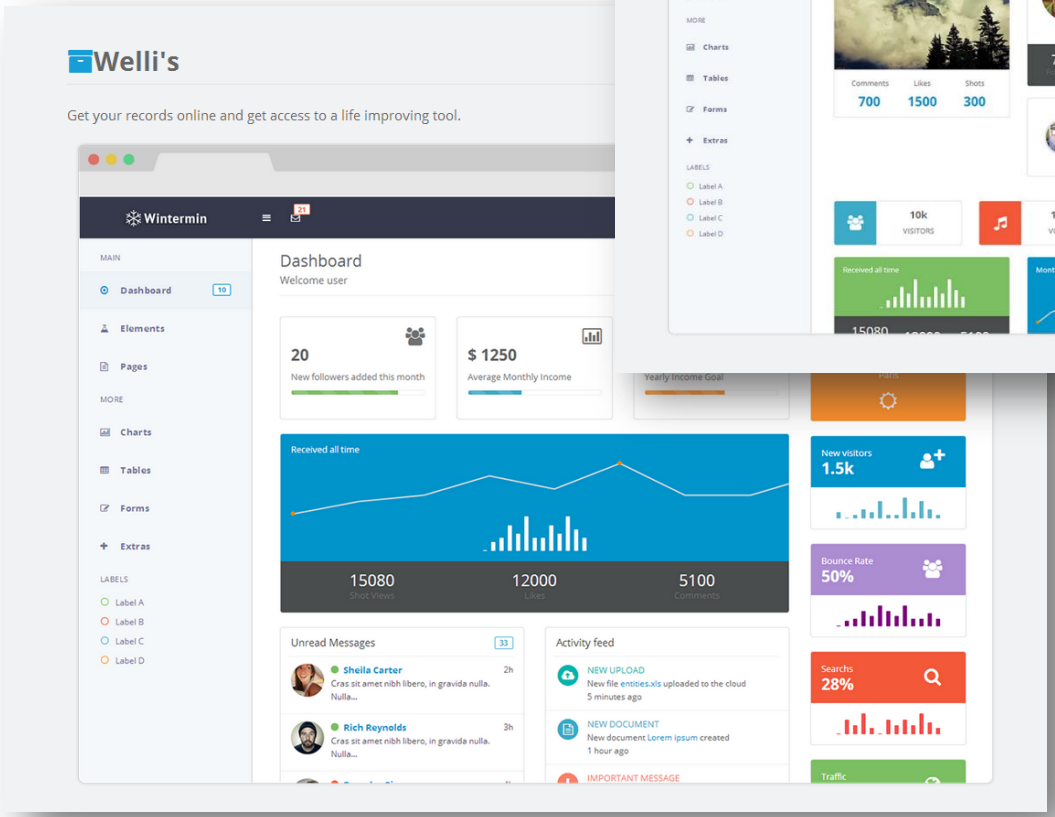
Remind Me App

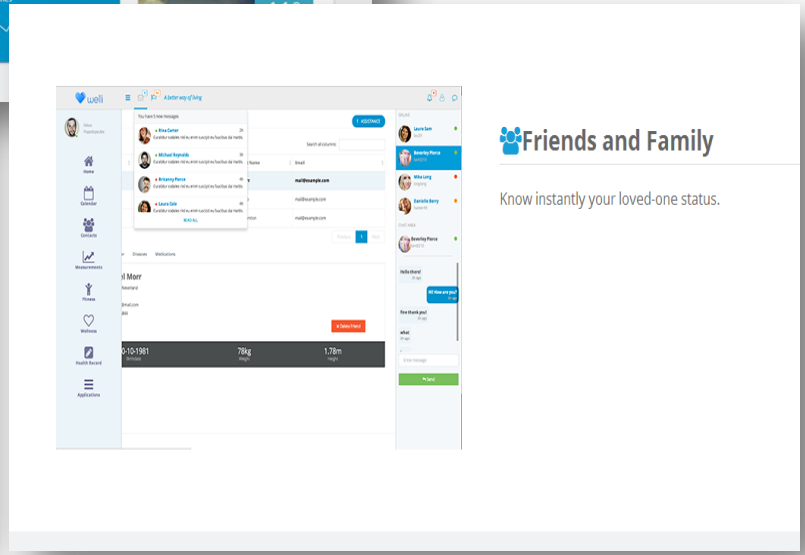
Innovative approaches for Telemedicine and eHealth – Intelligent wellness Platform













Thank You

Papadopoulos Homer

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