

---

***An Integrated Model to Capture the Provision  
of Health and Social Care Services Based on  
the ContSys and FHIR Standards***

---

Fabrizio Pecoraro, Daniela Luzi, Fabrizio L. Ricci

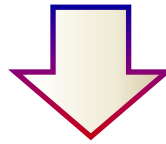
Institute for Research on Population and Social Policies

National Research Council, Rome – Italy

# Background #1

---

*There is a trend of demographic, epidemiological and social changes related to a growing number of older people, with multiple chronic conditions and functional and cognitive impairments*



*Increasing demand of integrated health and social services to be provided at home*

## Benefits

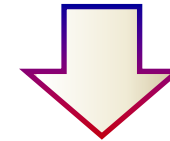
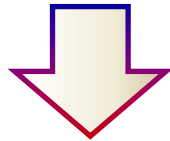
- Prevention of hospital admission by providing care to the subject at home
- Reduction of the hospital length of stay
- Reduction of the risk of medically-related adverse events such as infections
- Care can be provided more safely than in the hospital bed
- Support of the maintenance of patient's independence and confidence
- It is what most patients say they want

# Background #2

Issue

A common criticism of **home and community services** offered by different providers is that they are **fragmented**, resulting in poor outcomes and wasted resources.

***There is a need to improve the coordination and cooperation among stakeholders as well as the interoperability between information systems***



Vertical integration

**Primary care (GPs, ...)**

**Secondary care (Specialist, ...)**

**Tertiary care (Hospital, ...)**

Horizontal integration

**Health care (Therapy control, ...)**

**Social care (Counseling, ...)**

**Home care (Lifestyle, ...)**

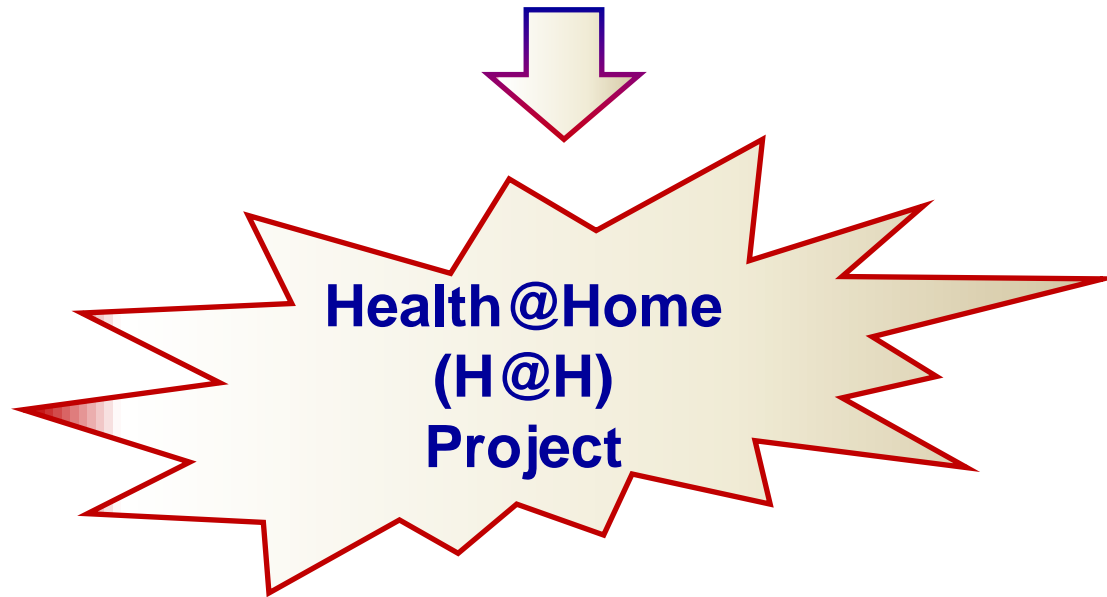
***Continuity of care***

**a prerequisite to improve efficacy, effectiveness and efficiency of health and social care.**

# Aim

## Purpose

To implement a common shared **conceptual model** that **defines the concepts** needed to facilitate sharing of **both care plans and their execution** between **different stakeholders in home care**.



# H@H

## What is

An open platform that provides a technological and organizational solution based on integrated and interoperable software services and Internet of Things. It supports both:

- **subjects of care** facilitating the access to and the management of a set integrated services provided at home by public, private, profit, non-profit organizations
- **organizations** offering a visible, open and common platform to promote, activate and deliver their services also facilitating the implementation of the relevant ICT functionalities

## Main Purpose

To improve the “quality of life” of citizens/families which have temporary or permanent weaknesses or chronic patients in outpatient settings that need health care assistance and remote monitoring

# H@H – Contexts

## Health

control of the state of health of the individual through

- monitoring of vital parameters (e.g. weight) and physical activity (e.g. walking)
- management of the therapeutic and/or rehabilitation paths (e.g. diabetics).

## Social

planning and management of

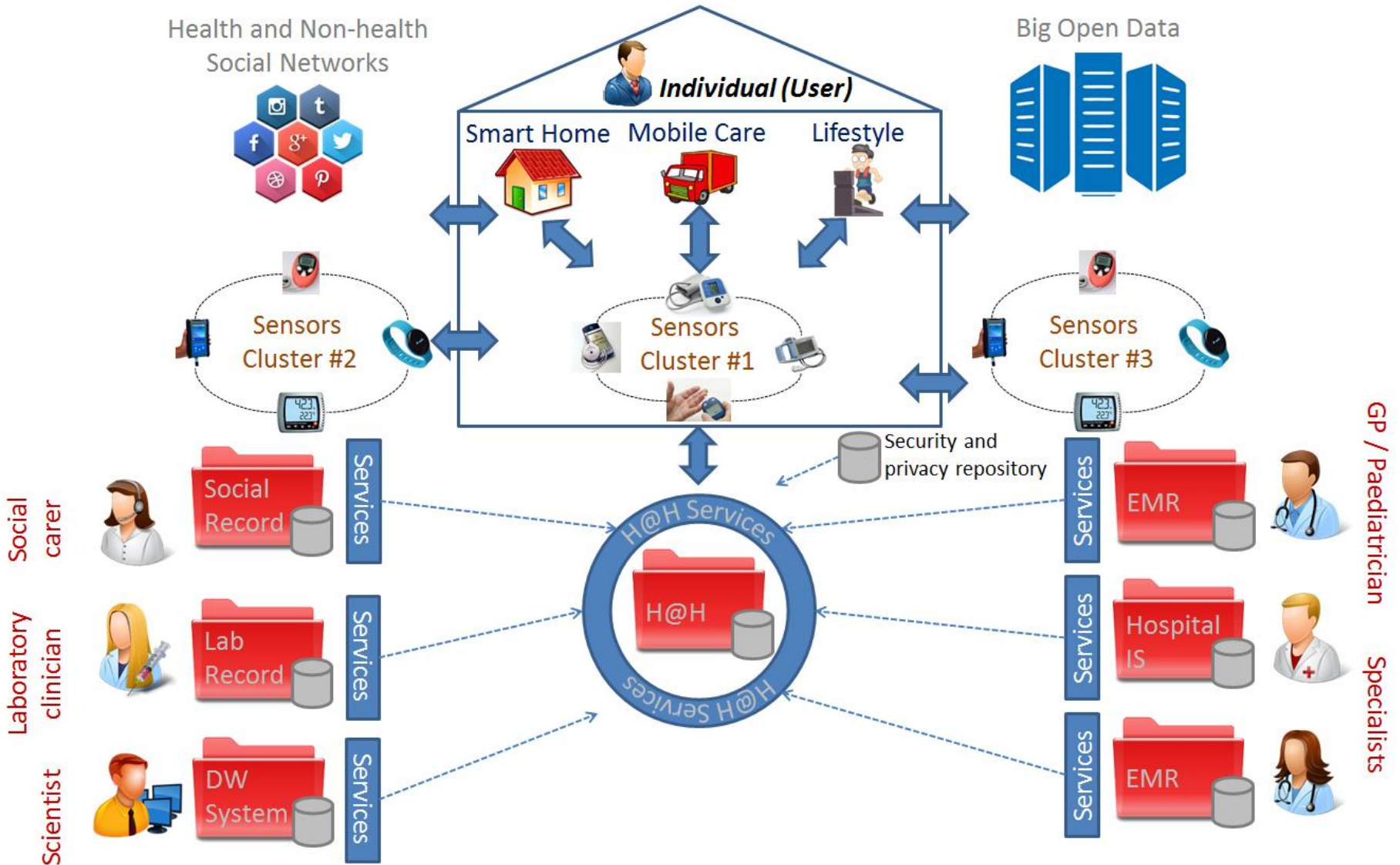
- activities and/or delivery of services (e.g. shopping, supply drugs, cleaning)
- management of administrative procedures (e.g. bill payment, sending certificates).

## Home autom.

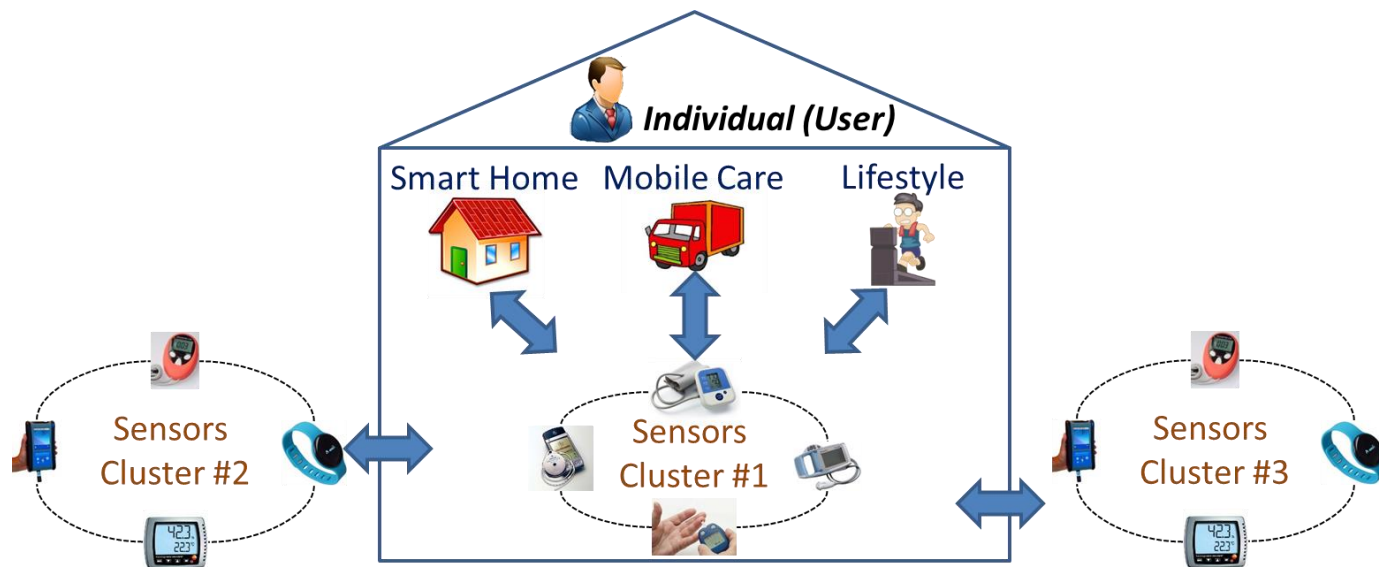
monitoring of

- environmental (e.g. temperature) and individuals (e.g. movement) parameters
- levels of security (e.g. gas leaks, access control)

# H@H – High-level description



# H@H – High-level description

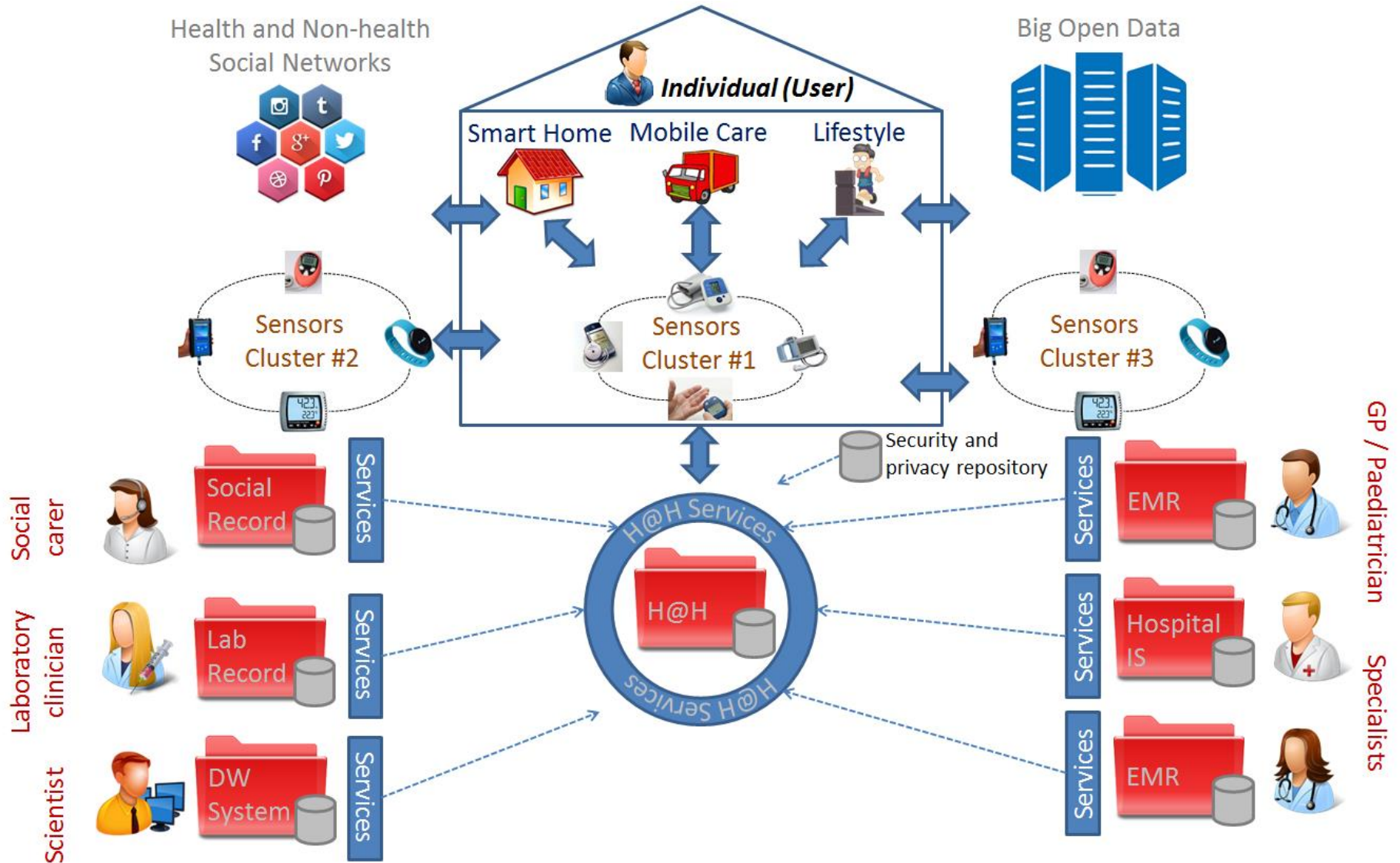


## Clusters of sensors

- **placed at home** (e.g. temperature and humidity, motion and occupancy, flood and leak sensors)
- **worn by the user** (e.g. fitness tracker, fall monitor, blood pressure measurement).
- **placed outside the home** to monitor user activities or other contextual information, such as weather conditions and forecast, transport facilities.



# H@H – High-level description



# H@H – Conceptual model

Task

Design the conceptual model to describe integrated home services focusing on the business process perspective

*The core of the system & the main concept of the model*

Activity

It influences the improvement or the maintenance of the individual's health state, his/her compliance to the recommended care plans and lifestyle.

Subject of care

involved in the

Provider

the carries out the

An activity is delivered between the individual (subject) in a place (location) when the activity is performed. The activity is performed by a professional (provider) for a specific condition (issue) when the activity is performed. The activity is performed why the activity is performed.

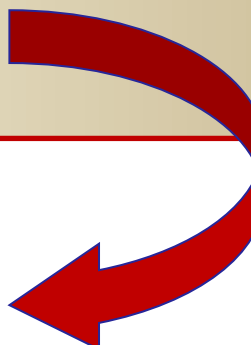
**ContSys Standard**

# H@H – Conceptual model

## Aim

- To define a common conceptual framework that:
- describes generic concepts of the health services
  - provided during the interaction between a subject of care and health professionals
  - in a patient-centred care delivery.

**However,**  
even if social care is an important determinant of care,  
its activities are not included in this standard



## Steps

1. Select a portion of the ContSys model that fits the purposes of the health part of the H@H project
2. Integrate it with a set of social care considering the home automation setting
3. Map the concepts of the integrated model with the resources of the FHIR standard

# ContSys (ISO 13940:2015)

## Actors

- Subject of care
- Provider
- Third party

## Matters

- Issue
- Condition
- State

## Activities

- Provider
- Self-care
- Third party
- Automated

## Process

- Adverse event
- Service

## Planning

- Care plan
- Guidelines
- Pathway

## Time

- Period
- Episode of care

## Responsibilities

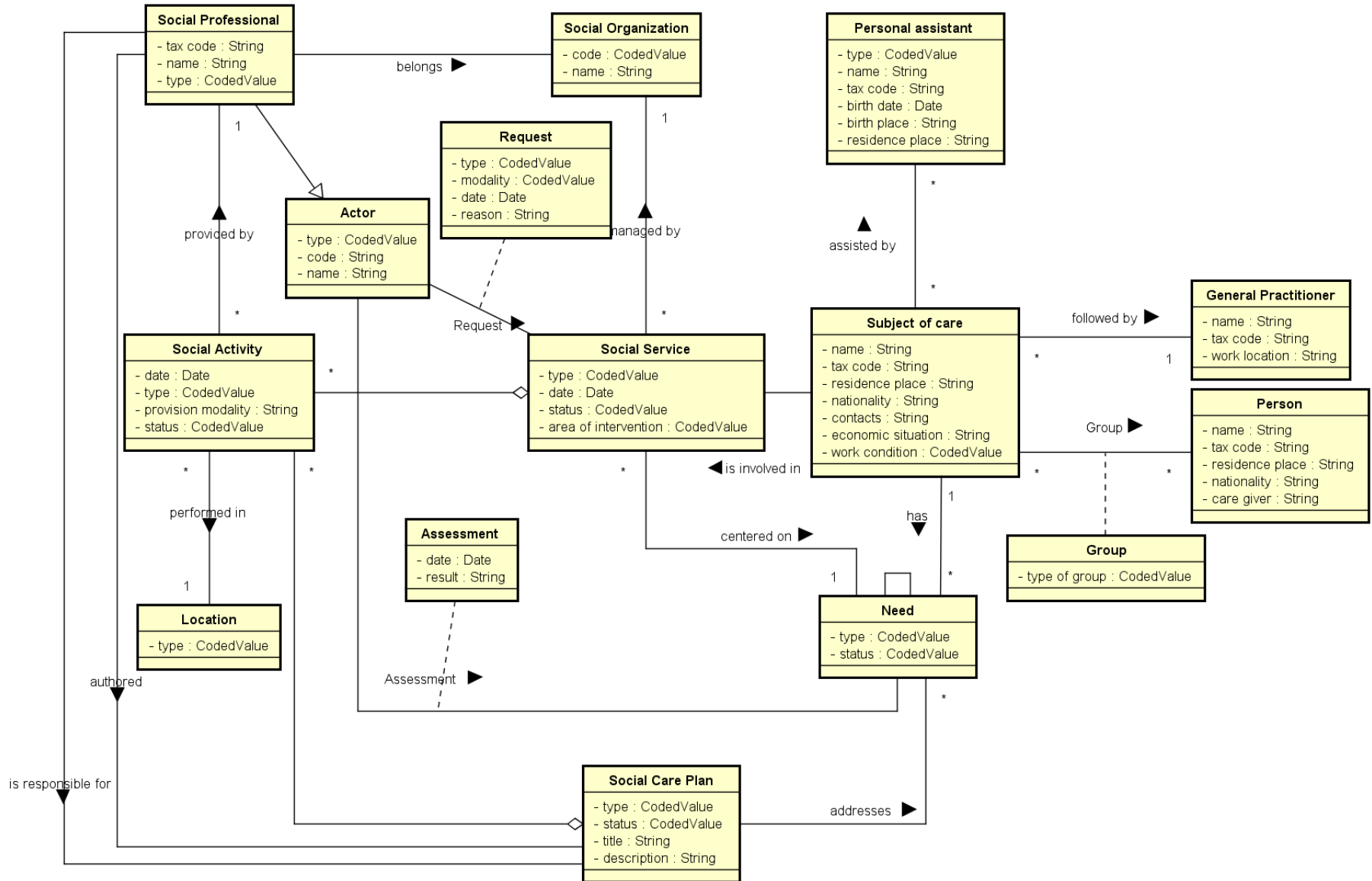
- Mandate

## Info management

- Health record
- Repository



# H@H – Conceptual model: Social care



# Identification of Social care concepts

---

## Shared

- Actor
- Subject of care
- Location

## Generalizable

- Social care Providers
- Social care Organization
- Social care Professional
  
- Social Activity / Service
- Social care plan

# Identification of Social care concepts

---

## To be adopted

- Third party (e.g. parents)
- Episode of Care (set of activities performed for an issue)
- Contact (encounter between patient and provider)

## Others

- General Practitioners (not present in ContSys)
- Need (similar to Health Issue)



# Mapping the integrated model with the FHIR

## *Straightforward mapping*

Model concept	FHIR resource
Healthcare Professional	AdministrativeResources. Individuals. Practitioner
Healthcare Organization	Base. Entities. Organization
Care Plan	Clinical. Care provision. Care Plan
Third Party	AdministrativeResources. Individuals RelatedPerson
Episode of care	Workflow. Encounters. Episode of care
Contact	Workflow. Encounters. Encounter
Other Person	AdministrativeResources. Individuals RelatedPerson
Group	AdministrativeResources. Groups. Group
Device	AdministrativeResources. Device. Device & AdministrativeResources. Device. Component
Health issue	Clinical. General. Condition

# Mapping the integrated model with the FHIR

## Resources to be accommodated

Model concept	FHIR resource	Accommodation
<b>General Practitioner</b>	Base. Individuals. Practitioner + Practitioner Role	The role of the practitioner is set to GP.
<b>Need</b>	Clinical. General. Condition	Condition refers to health problems. So this resource should be accommodated to describe social needs at least in terms of vocabulary as well as nomenclatures.
<b>Social care Professional</b>	AdministrativeResources. Individuals. Practitioner	Extends the vocabulary items to include the type of social care practitioner
<b>Social care Organization</b>	Base. Entities. Organization	Extends the vocabulary items to include the type of social care organization
<b>Location</b>	Administrative Resources. Entities. Location	Extends the vocabulary items to include the type of social care delivery location

# Mapping the integrated model with the FHIR

## Resources to be extended

Model concept	FHIR resource	Accommodation
<b>Subject of care</b>	AdministrativeResources. Individuals. Patient	Includes attributes to capture social and economic status.
<b>Healthcare Activity</b>	Clinical. General. Procedure	Includes an attribute to capture the type of healthcare activity performed (e.g. visit, lab exam, etc.) and an attribute to capture whether the activity is an automated, a self, a contributing or a provider activity
<b>Social Activity</b>	Clinical. General. Procedure	Includes an attribute to capture the type of social activity performed (e.g. cleaning, good provision, etc.)

# Conclusions

---

The paper proposes a first attempt to define a conceptual model that:

- Integrates social and health care concepts on the basis of the ContSys standard deployed to improve the continuity of care.
- Maps the concepts of the integrated model with the FHIR resources to capture feasible resources that conform to the content and context of the ContSys concepts.
- It can improve the interoperability between systems as well as the coordination and cooperation of different stakeholders in an comprehensive continuity of care process.
- It is a starting point to analyze the various determinants of well-being able to guarantee a high-level of individual's quality of life.

# Issues & Future works

---

- Although, the FHIR infrastructure has been proved to be stable while the resources are still subject to improvements.
- The conceptual model of the social piece should be further improved considering information systems already in place
- The integration of the health with the social model as well as the mapping with the FHIR should be performed at an attribute level.
- Of course the introduction of these resources and/or the introduction of new ones should be subject to significant review through ballot and other HL7 processes.
- The feasibility of the proposed approach should be verified considering the standards under development, such as the ISO 13606-3:2017.

# Present & Future works

---

## UNINFO

On behalf of the UNINFO, the branch of UNI, the Italian Standardization body, that tackles ICT activities, our team is setting up a new working group with the aim of “extending the ContSys standard by integrating it with concepts related to social care so as to have a formal description as support to define a standard for exchanging the information in social and health care settings”.



---

# Thank you for your attention

Fabrizio Pecoraro  
f.pecoraro@irpps.cnr.it