# Software Architecture Design Assignment

Ambient Assisted Living : Elderly Care at Home

Larger percentages of the population are growing to older age. For various reasons, elderly people remain living longer in their own houses for up to ages where previously they would have moved to nursing-homes for the elderly. Information technology can help support elderly people in living in their own homes. This case looks into some of the possibilities for this.

The Figure below gives an overview of the broader context called 'ambient assisted living'. In this assignment we focus on 'Health & Wellness', 'Hobbies', and 'Safety Privacy and Security'.
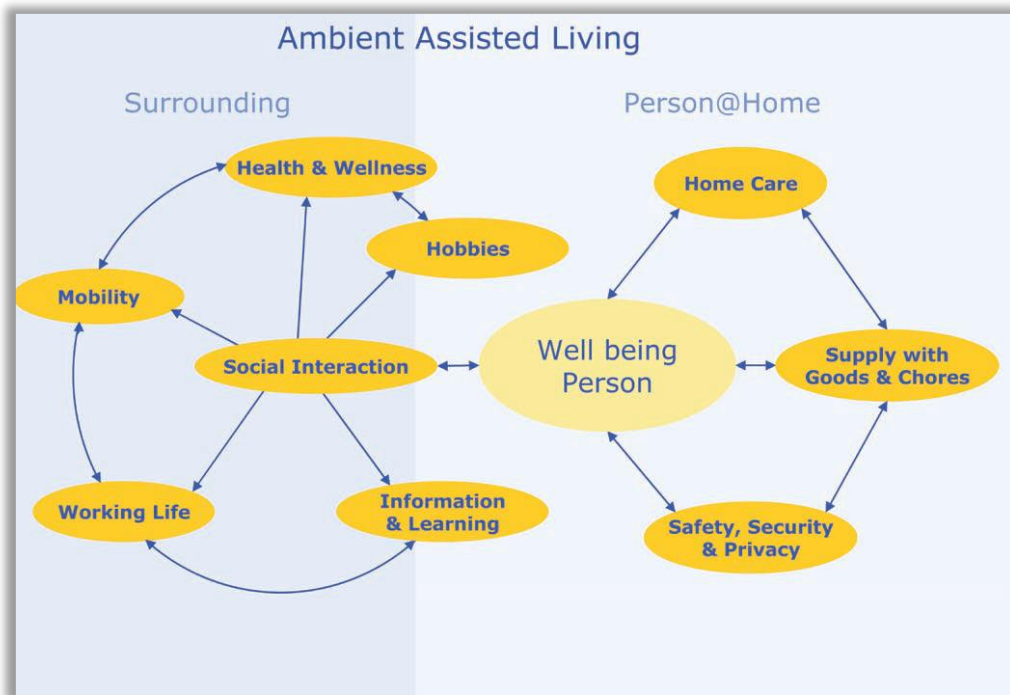
For this assignment, we assume that a house is equipped with all the necessary sensors, networks and computing infrastructure.

Next, we describe some of the functionality of the system:

Features:

1. **Health:**
   We assume that the person(s) living in the house have a wristband that performs step-counting and heart-rate monitoring. These wristbands are probably from a commercial provider such as FitBit or Polar or comparable. Steps-count and heart-beats are measured every 5 seconds. These devices exchange data with a Bluetooth hub that is place in the house.
   On a daily basis, the inhabitant also log data regarding their glucose (2 measurements per day) and blood-pressure (once a week).

2. **Safety:**
   Smoke Sensor: there are sensors in the kitchen and living room that trigger an alarm if the sensors detect smoke. This alarm is sent to the nearest-by care-giver that comes over as soon as possible to check the situation.
   Movement Sensor: There are sensors in every room that sense movement. There is a filter that filters out movement of pets like cats or dogs. If the movement sensor either detects a fall of a person or the long-term absence of movement, then the system triggers an alarm. This alarm is sent to a nearby station of medical service. They come to the house as soon as possible and decide which medical help is needed.

3. **Security:**
There is a security-app that shows the (real-time) status of all the outside doors and windows (open or closed). Authorized users can open or close locks remotely. If the house is in 'holiday' status, then it will send an alarm to selected users if a window or door is opened.

4. **Social Interaction / Photo Carousel:**
The home can have a digital display for photos and video's (like a 'digital photo frame'). Friends and family can share photos with the inhabitants. Also, the inhabitant of the house can upload photos. The photos are stored permanently. This display will show a selection of the photos in a carousel-style – i.e. photos are shown alternatingly for about 1 minute.

5. **Dashboard:**
All types of data from the home are collected and made available through a dashboard. Various people have access to different types of data that can be seen through this dashboard. The dashboard is organized in themes: there is a health and medical-section, there is a security-section, Family and close friends can see basic information, care-givers such as nurses, doctors and first-aid personnel can access all medical data. This dashboard can be rendered on a browser, on a TV, on dedicated apps on tablets and on smart-phones.

6. **Face Recognition (Advanced):**
The system may have a service for face recognition. This service recognizes a person when known in its database based on an image. This image can be captured by various devices in the home, such as the camera at the front door, the camera in the TV. In return to a request, this service returns the *id* of the person, or otherwise 'unknown'. The system also recognizes cats and dogs.

7. **Composite logic (Advanced):**
There is a way to enter small scripts into the system. This scripts may combine events from different devices. Scripts are of the following type:

$$\text{If } \langle event \rangle \; \{(and/or) \; \langle event \rangle\}^{*} \; \text{then} \; \{\langle action \rangle\}^{+}$$

For example

```
If <doorbell.rings> and <doorcam.face='daughter'> then <door.open>
```

For such a rule to 'trigger', we assume that the events happen within an interval of at most 5 seconds (we will ignore the temporal elements in the formulation of such rules).

Such rules can be entered and modified at any time while the system is running.
Clearly only authorized users can enter and modify such rules. The system keeps track of who defined/changed which rule and when.