
Ambient Assisted Living (AAL) – Concept and Contributions to eHealth and Personalized Health Care

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Personalized Health Care (Personalized Medicine)

Motivation / Objectives:

- **Early detection** of **individual** influencing **factors** on health status
- **Customizing / Optimization** of therapeutic and preventive strategies
(-> effectiveness, adverse effects)
- **Monitoring** of treatment, health status and costs (-> efficiency)

Examples / Forms:

- Individualized Medication: medicine and dosage is tailored to patient's genomic status for maximum effectiveness (Pharmacogenomics)
- Integration and joint processing of patient-related data from different sources (biomarkers, imaging, electronic health records / data repositories etc.) using individualized Patient Models (Model-based Therapy)

Genetic and molecular information, medication and imaging dominate the scope of Personalized Health Care.

What is Ambient Assisted Living (AAL) ?

see e.g. „Article 169“ - EU AAL Joint Programme (2008...)!

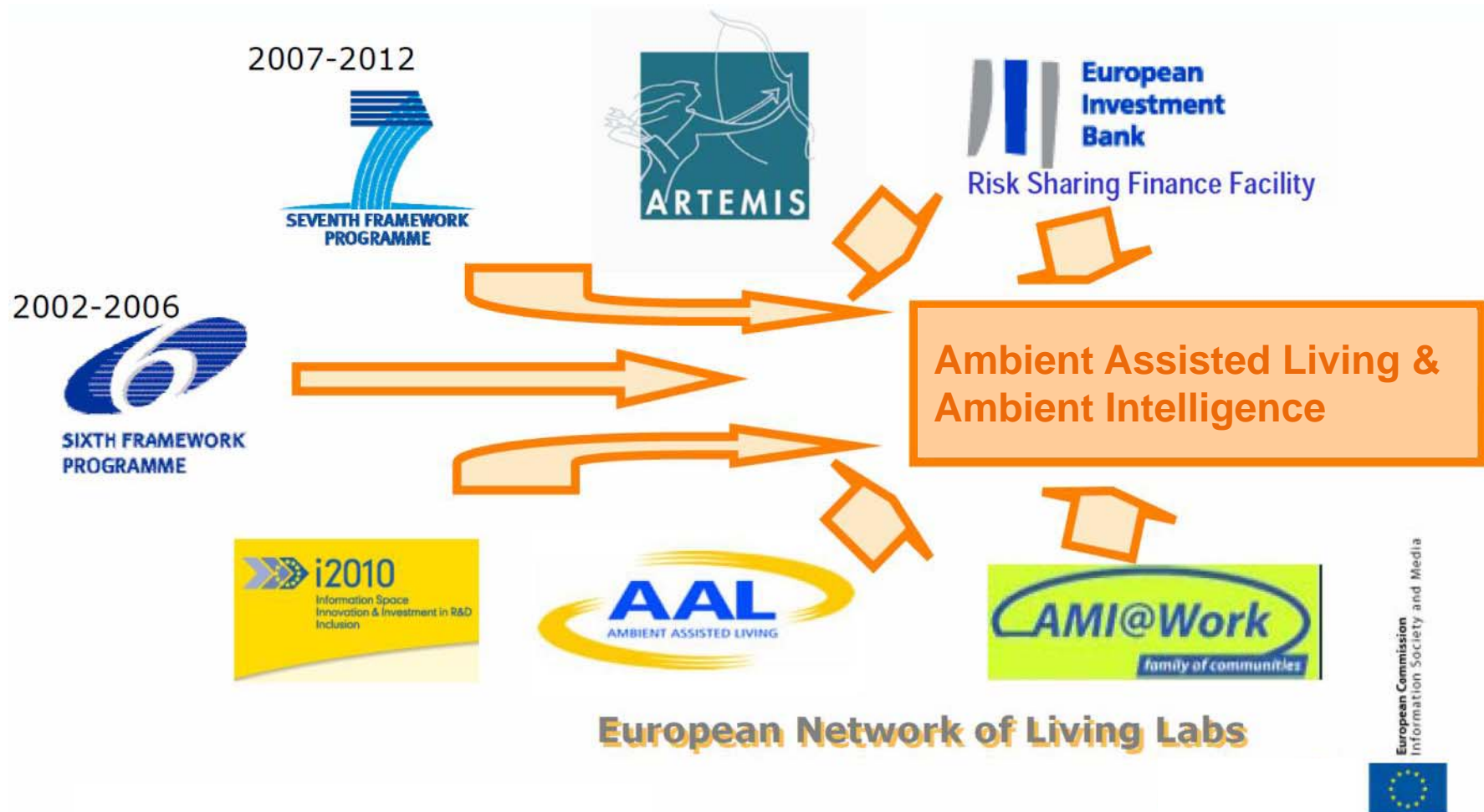


- It will stimulate the development of products and services for societies being characterised by demographic changes
- It will improve policy co-ordination in a field where the innovation process has to be accompanied and stimulated by public authorities because of its social dimension.

"Ambient Assistance" means the use of intelligent, highly personalised networked embedded objects and systems that are surrounding the user and serving specifically elderly people in a customised manner. Nevertheless, these products and services will not only be used by elder people. People with disabilities would profit from these innovations as well.

The embedded systems will be nearly invisible small, networked with a huge number of others and nearly everywhere.

EU Activities and Structures Related to AAL

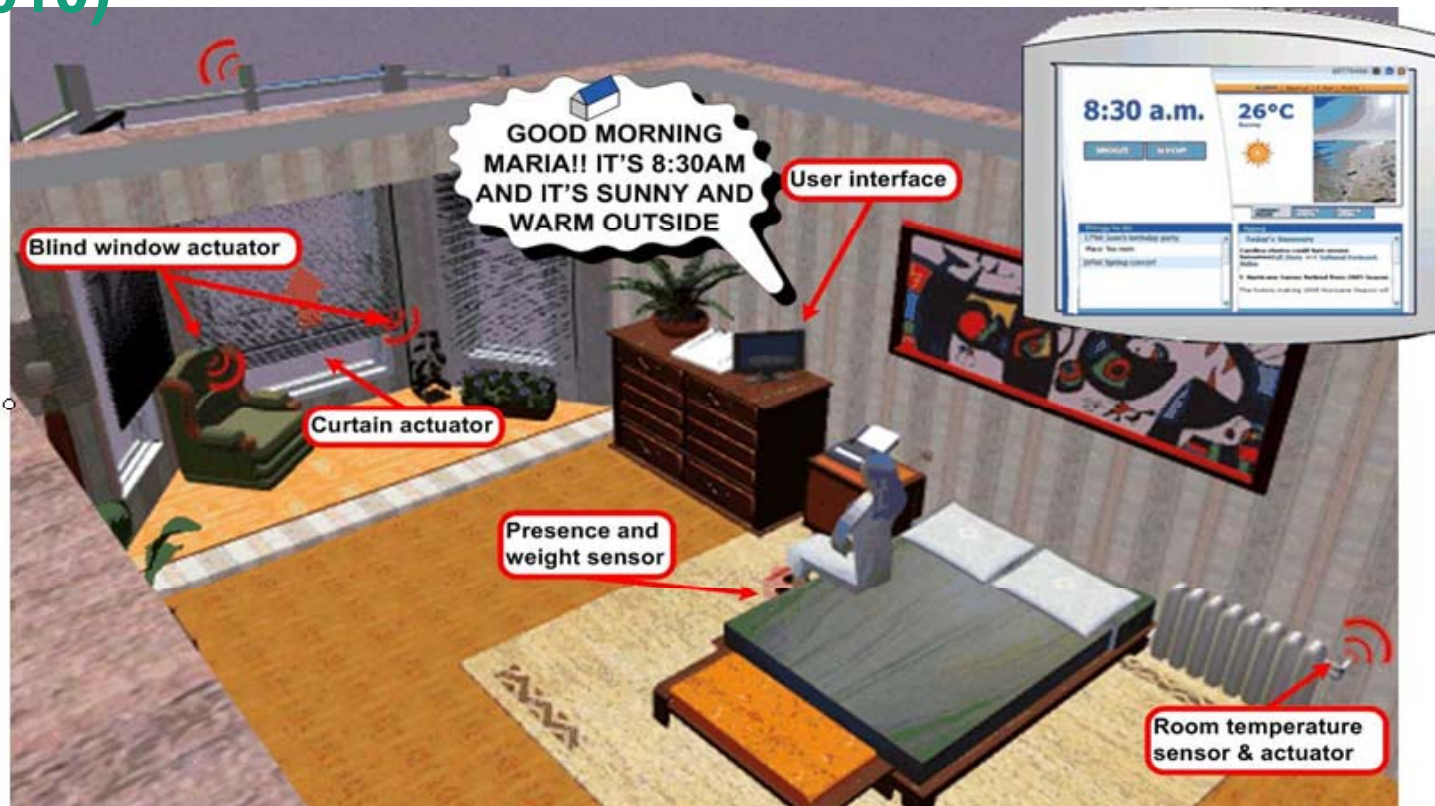


What is Ambient Intelligence (AmI)?

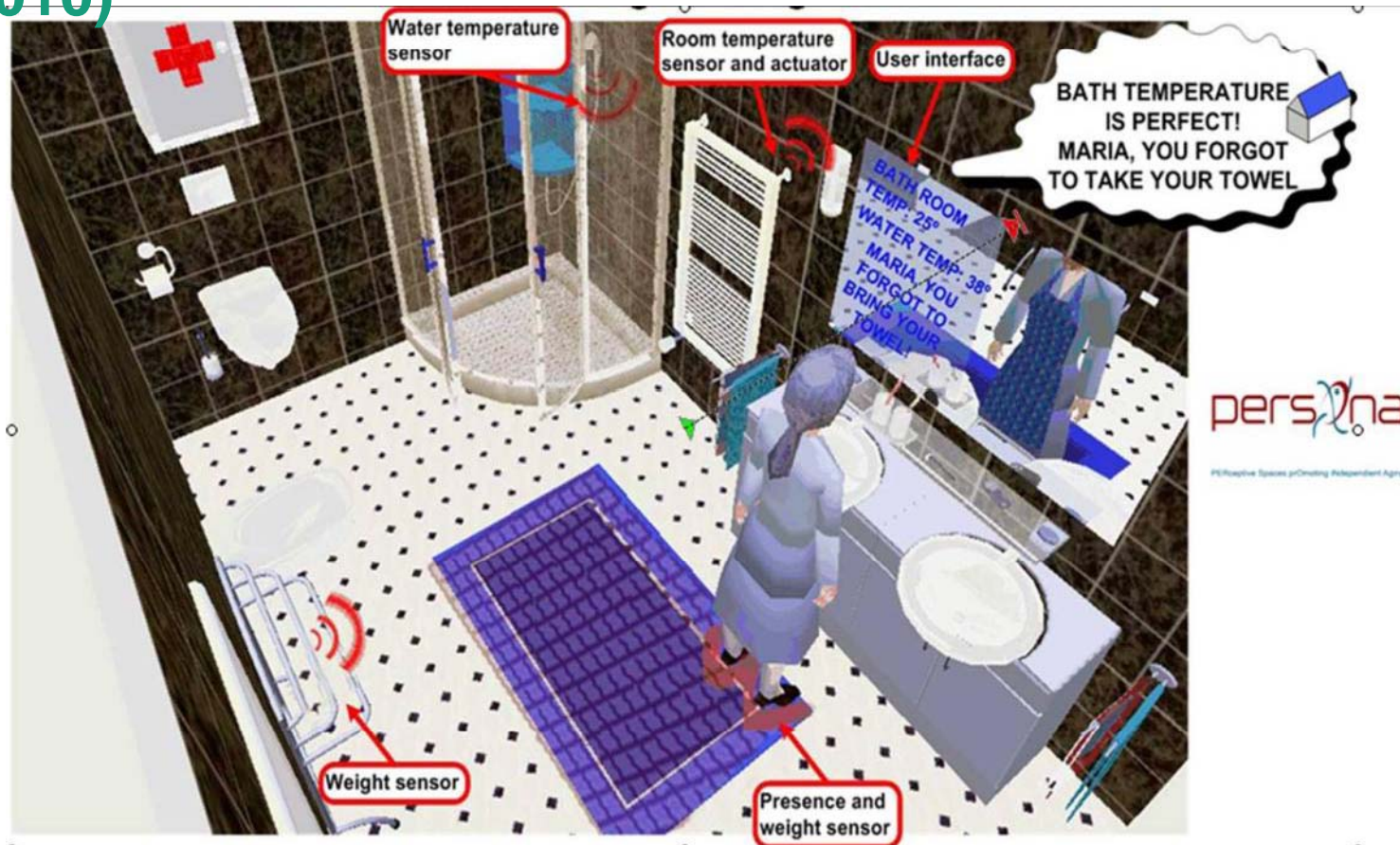
Ambient Intelligence defines systems and technologies that are:

- embedded:** many networked components (sensors, devices) are integrated into an environment
- context-aware:** an environment recognizes individual users and their situational context
- personalized:** an environment / system tailored to individual needs
- adaptive / responsive:** environments / systems change in response to individuals
- anticipatory:** environments / systems anticipate user requirements and desires without conscious mediation

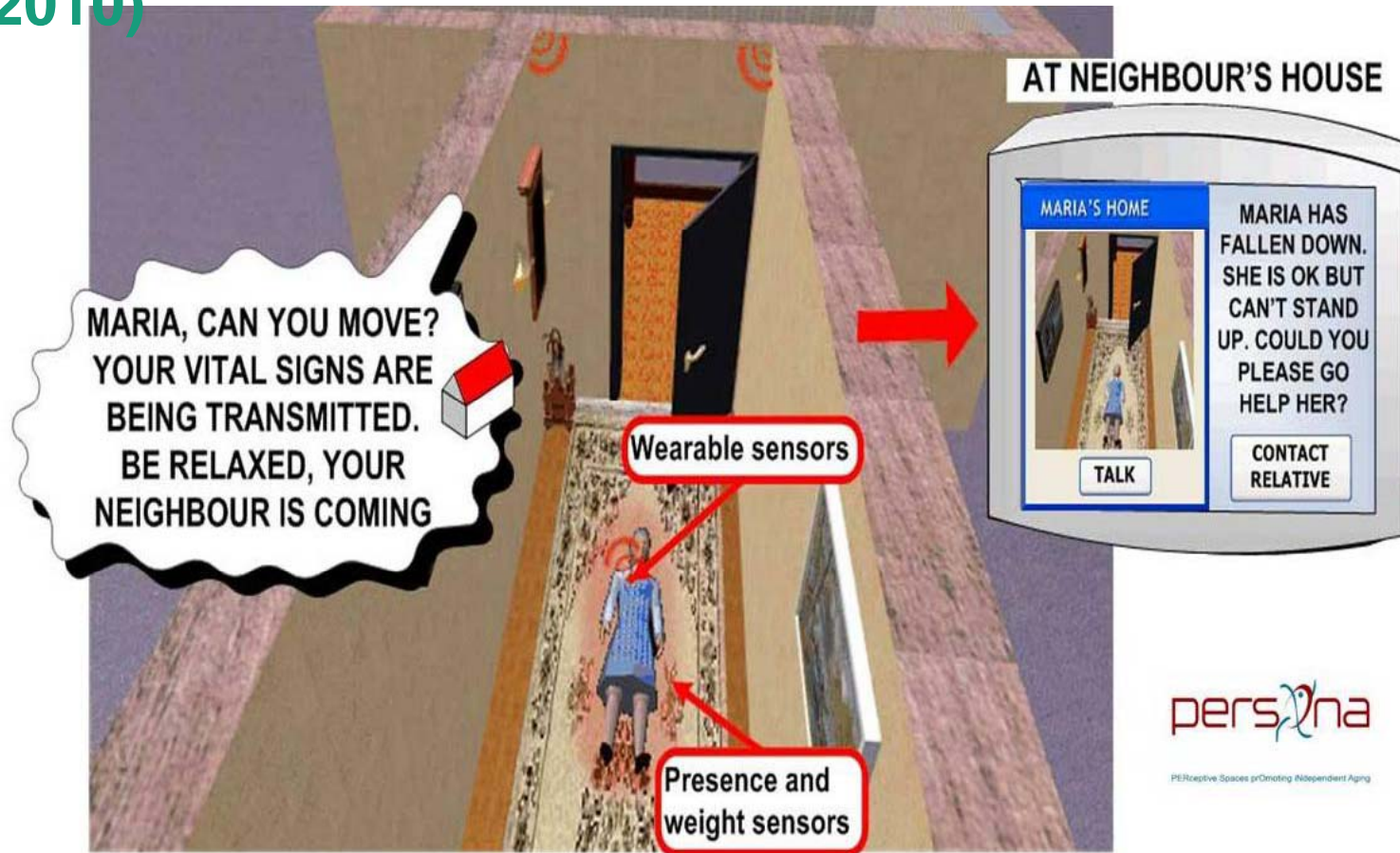
AAL Scenario I (EU IP Project PERSONA, 2007 - 2010)



AAL Scenario II (EU IP Project PERSONA, 2007 - 2010)



AAL Scenario III (EU IP Project PERSONA, 2007 - 2010)



Fraunhofer Innovation Center »inHaus« (Duisburg): »Smart Home« with Ambient Intelligence

automated alarming of neighbors,
children, service center

carpet with
fall sensors

sleep pulse monitoring
by sensor mattress

activity registration
by light switches,

toilet flush,
doors,
windows

Linked
motorized
door and
window
control

Emergency detection
based on reference
activity / presence profiles

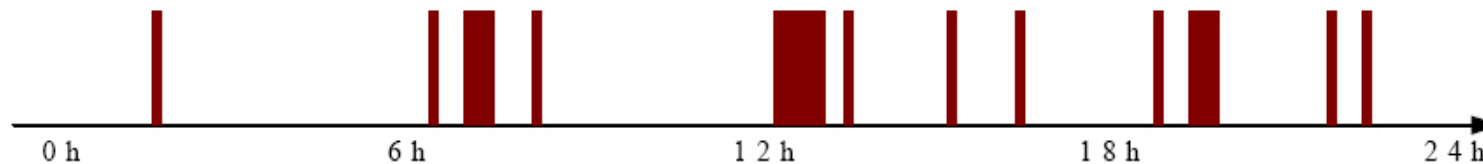
automated
emergency
switch-off for
dangerous
devices, e.g.
stove / cooker

visitor identification

emergency management
with voice instructions,
light signals and
actuating elements



24 hr reference presence profile for the kitchen



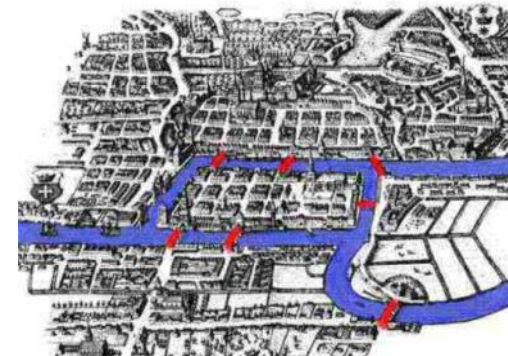
Ambient Assistance for Personal Mobility



Navigation in urban areas for pedestrians & escort vehicle (scooter)

- Ubiquitous seamless global outdoor and indoor localization
- **Scooter** with dynamic route planning for assisting pedestrian
- **Semi-autonomous** tracking and driving functions based on relative localization

Which way shall I take?



What is Ambient Assisted Living (AAL) ?

- Smart assistive environments that are sensitive and responsive to the presence of people.
- Components / devices cooperate to support / assist people in carrying out their everyday life activities using information and intelligence in the network connecting these components / devices.
- As components / devices get smaller, more connected and more integrated into environments, technology virtually disappears until only the user interface remains perceivable by users.

-> Ambient Assisted Living (AAL) is an application domain of
»Ambient Intelligence«

-> Ambient Assisted Living (AAL) also includes personal
health-related applications: AAL = pHealth / **»Personal Health«**

What is Personal Health ?

- used in terms like »Personal Health Record«, »Personal Health Care« etc.
- identifies increasing **individual / private customer availability** of medical equipment, information and services that were traditionally only accessible for health care professionals / professional institutions
(- similar to the establishment of **Personal Computers** complementing professional computing equipment).
- characterizes the transition from traditional organization-centric health organization of health services to **person-centric individualized services / personal responsibility** for prevention, diagnostics, therapy and care (eHealth / pHealth)
- **Personal Health Systems** include portable medical devices or systems specifically designed for **diagnostic and therapy-supporting (long-term) monitoring application in home or mobile** environments.

2009: ca. 200 Continua members developing Personal Health solutions



Disease Management

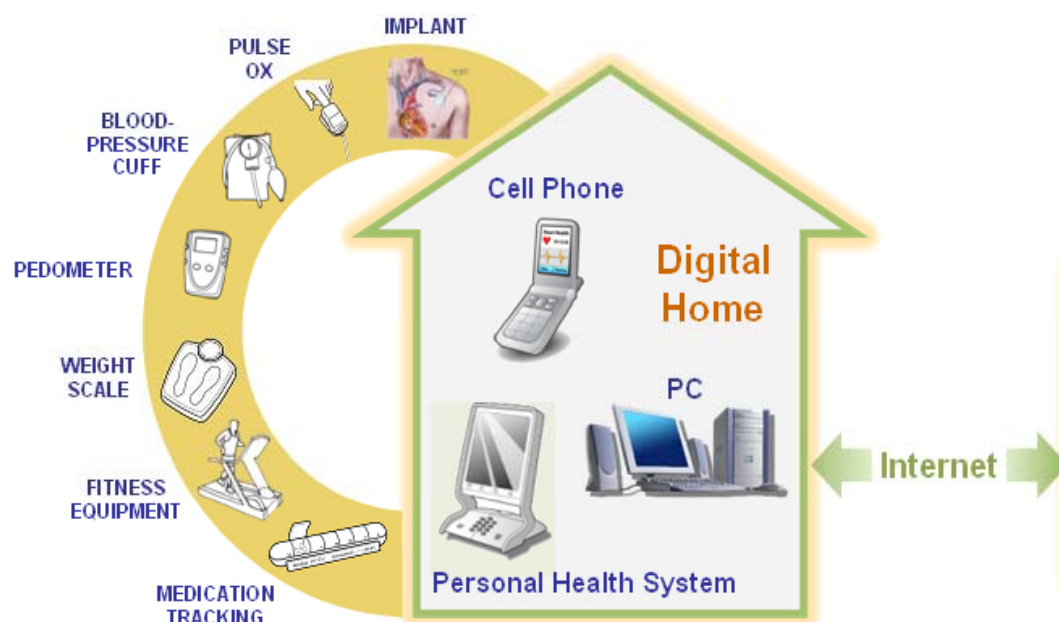
860 million chronic disease patients world wide



- Chronic disease
- Post trauma
- Pre-op

Disease Management

- Vital sign monitoring (Remote Patient Monitoring)
- Medication reminders and compliance
- Utilize home network to locate devices in logical places:
 - Scale in bathroom
 - Pill minder in kitchen
 - Blood Pressure cuff in living room
- Trend analysis and alerts
- Email, chat, video
- Appointment scheduling



Continua member companies help people with chronic conditions live healthier lives by connecting them to their care team through a more efficient exchange of personal health information.





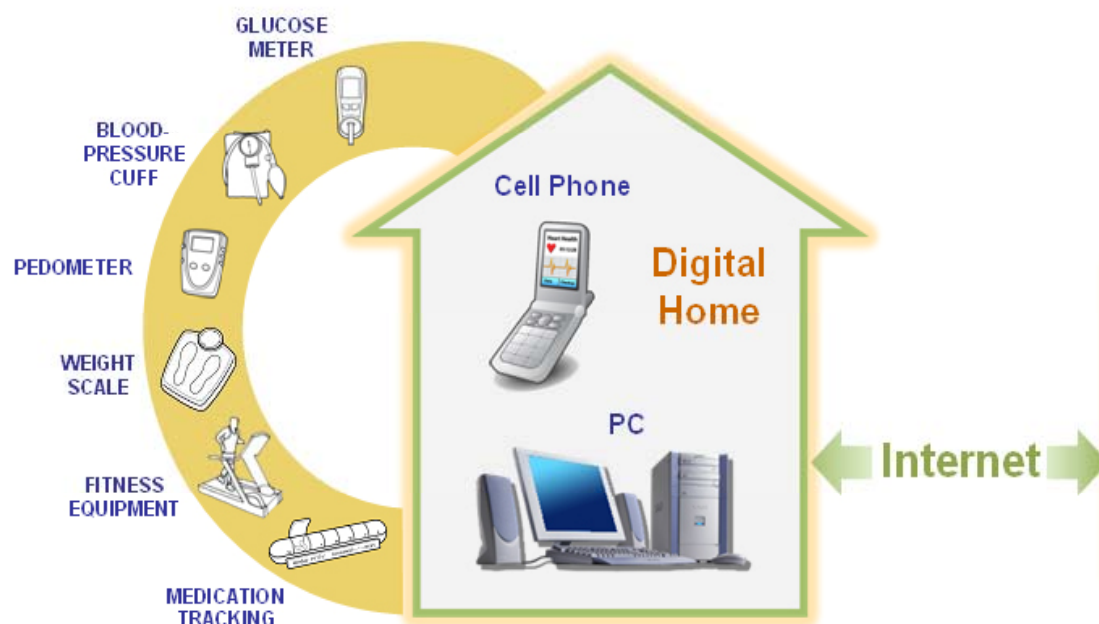
**Healthy
Family**

Health & Wellness

- Weight loss
- Fitness
- “Worried Well” vital sign monitoring:
 - Weight
 - Blood pressure
 - Glucose
 - Cholesterol
 - Activity level
- Personal Health Records
- Appointment scheduling

In the future...

- Extension of healthcare system into the home
- Initial triage of non-emergency conditions
 - Vital signs
 - Images
 - Email / chat / video



Continua member companies help people live healthier, more active lives by connecting them to their health and wellness team through a more efficient exchange of their personal fitness information.



Aging Independently

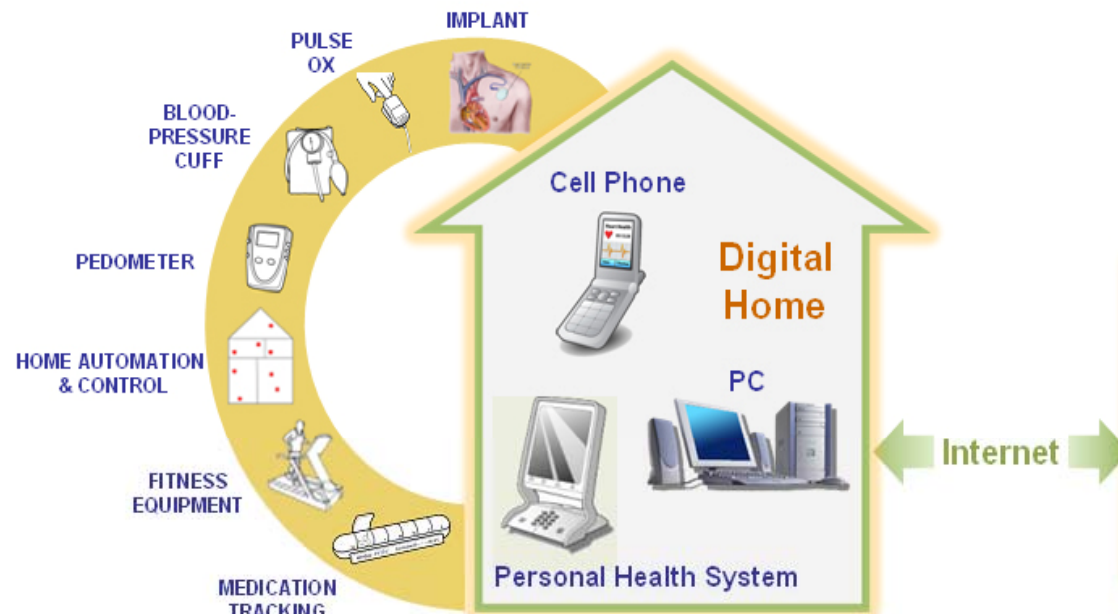
600 million elderly individuals world wide



- Independent living
- Chronic disease

Aging Independently = „Ambient Assisted Living“ !

- An adult child helping their elderly parents age gracefully in their own home
- Basic life monitoring as appropriate (ADL):
 - Bed pressure (sleep)
 - Bathroom sensor
 - Gas / water sensor
 - Emergency sensor
- Vital sign monitoring (RPM)
- Medication reminders and compliance
- Trend analysis and alerts
- Email, chat, video
- Appointment scheduling



Continua member companies help the elderly age independently, with dignity and security, through the efficient exchange of personal health and safety information that connects them to their family and care team.



Family
care
givers



Elderly
monitoring
services

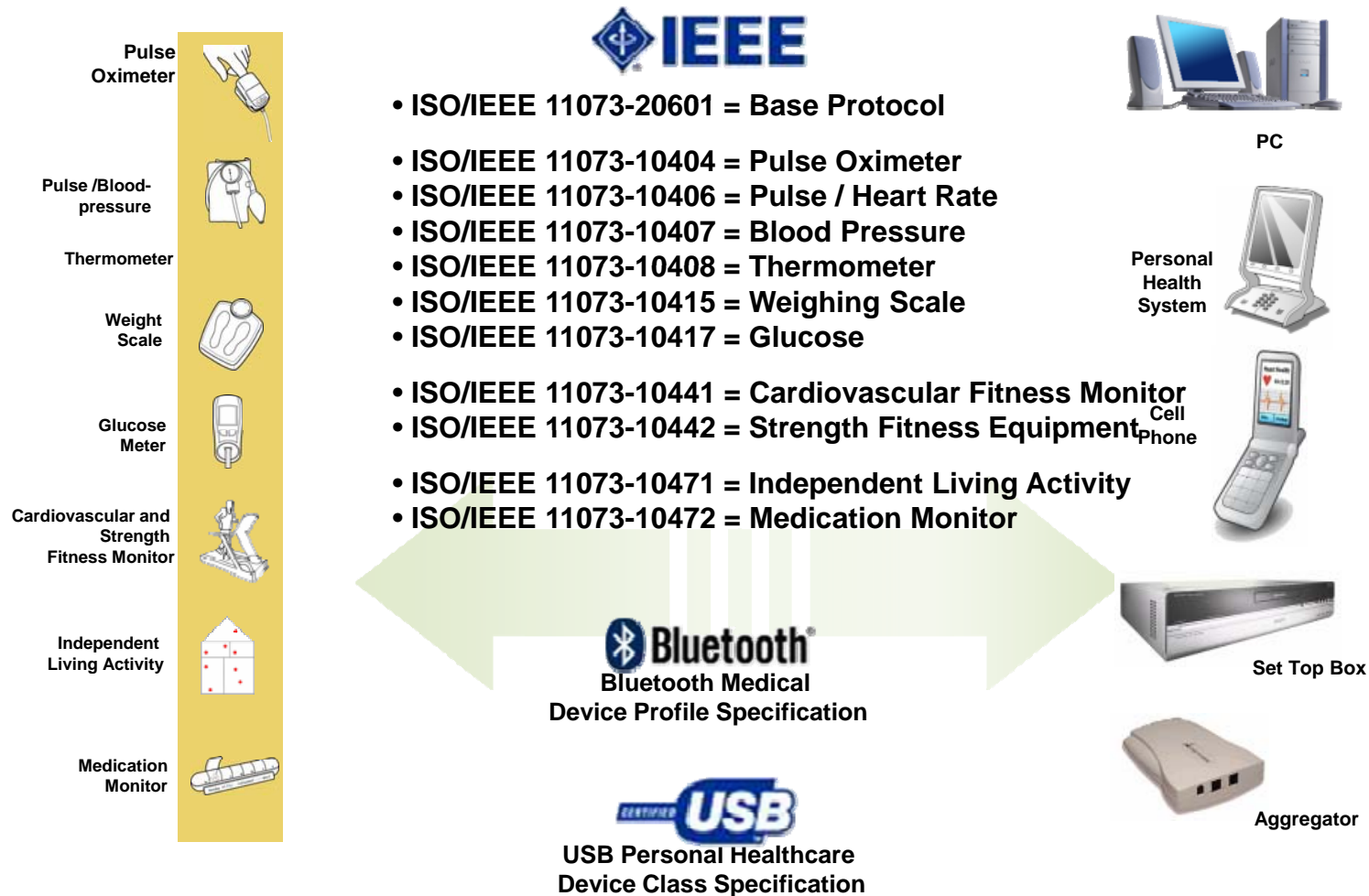


Diet &
wellness
services



Disease
management
Service,
Healthcare
provider

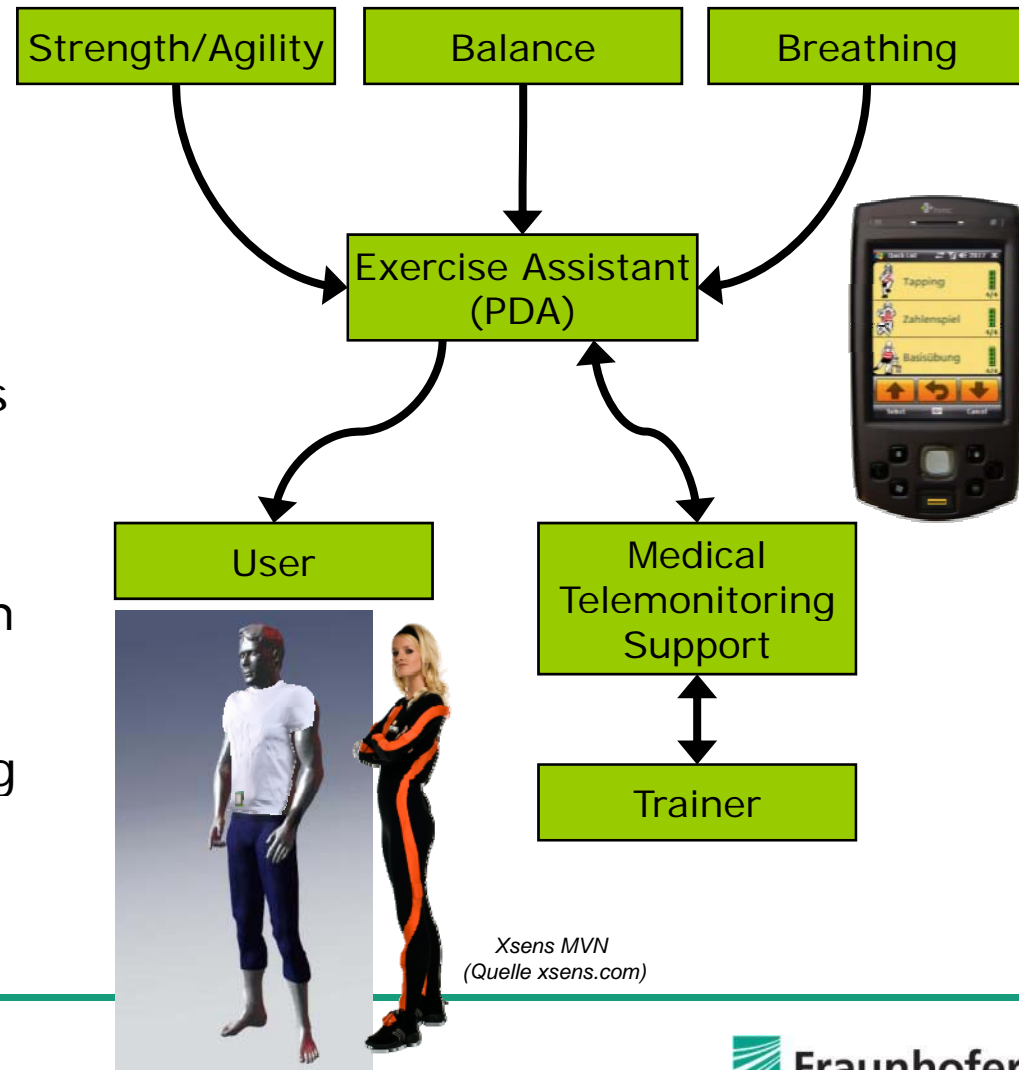
Continua Version One Device Connectivity Standards



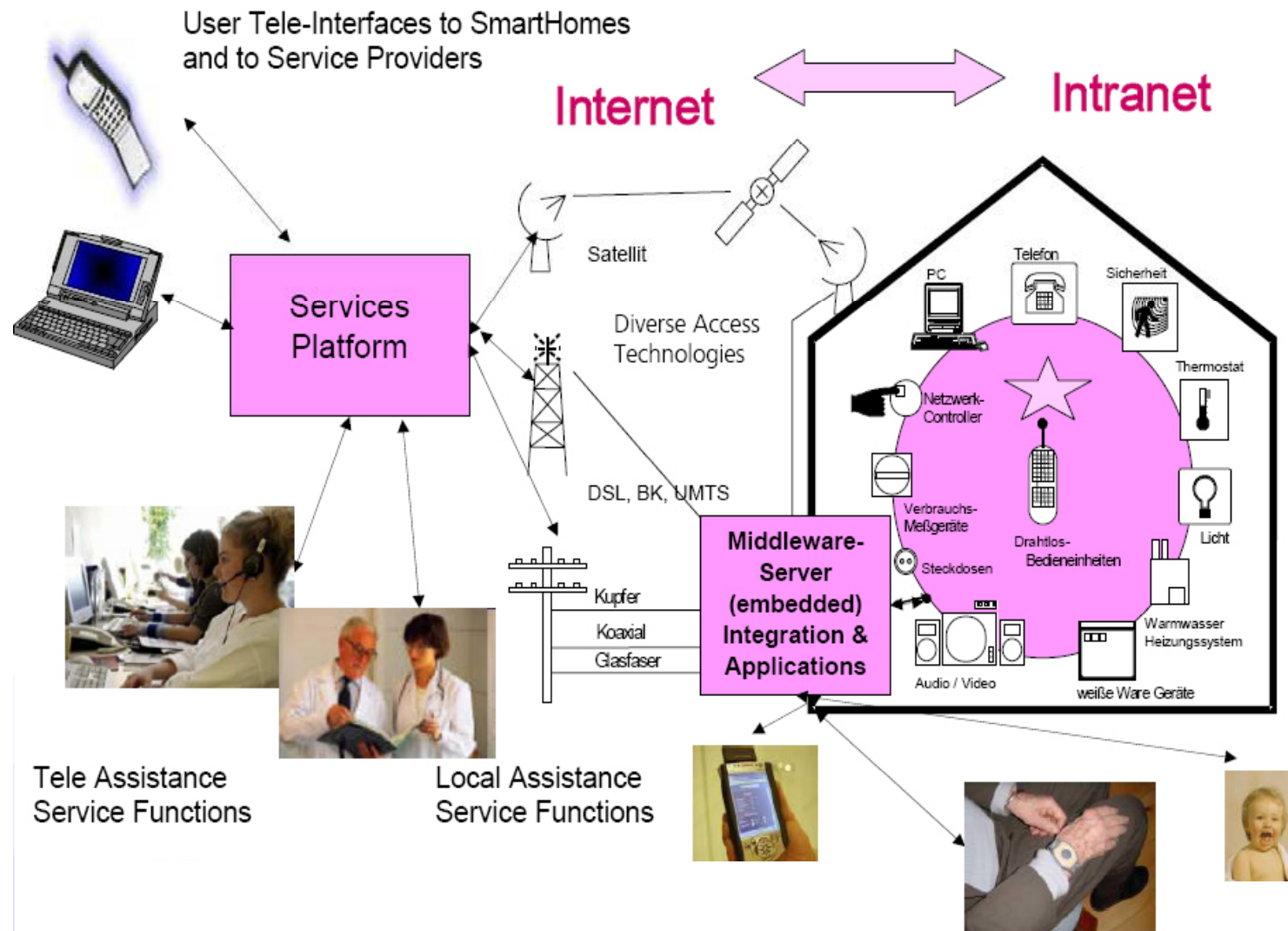
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Fit4Age Exercise Assistance for Fitness

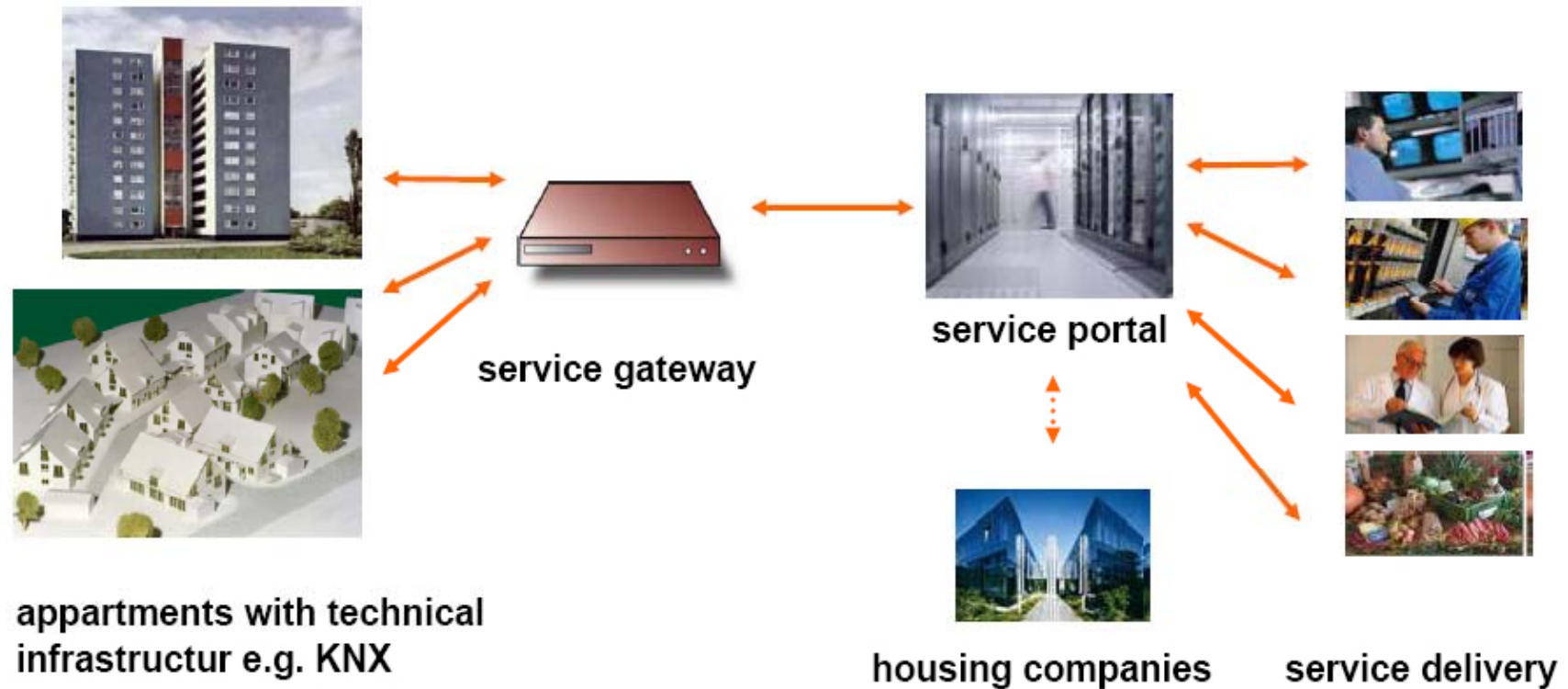
- Registration, processing and analysis of relevant parameters like strength/agility, breathing and balance
- using miniaturized wireless sensors preferably integrated into textiles
- Telemonitoring service with personal trainer support
- System feedback qualifying exercise success for both trainer and user



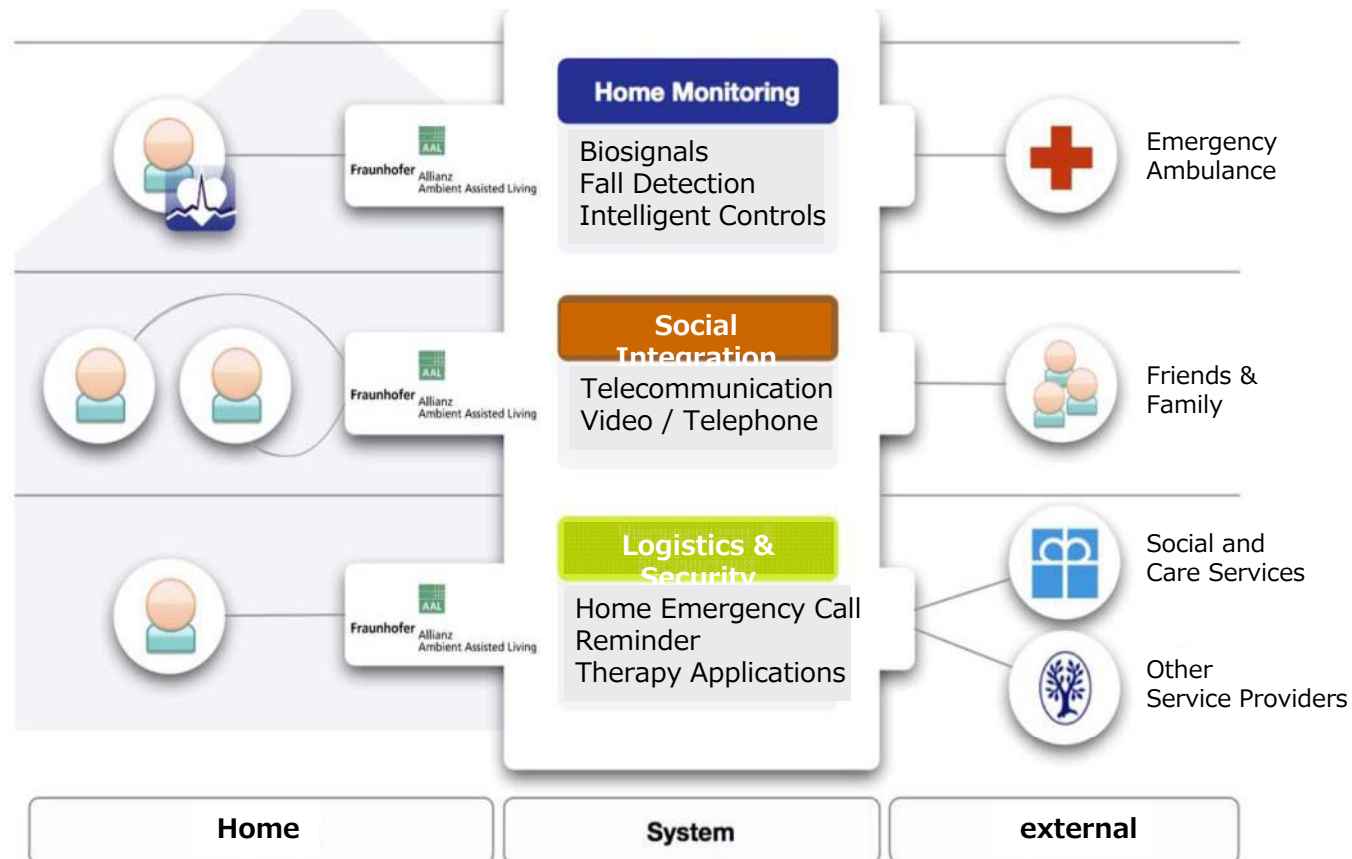
Integration of Local Functionality and Remote Services



Pilot Application: Smart Living NRW (Fraunhofer ISST)



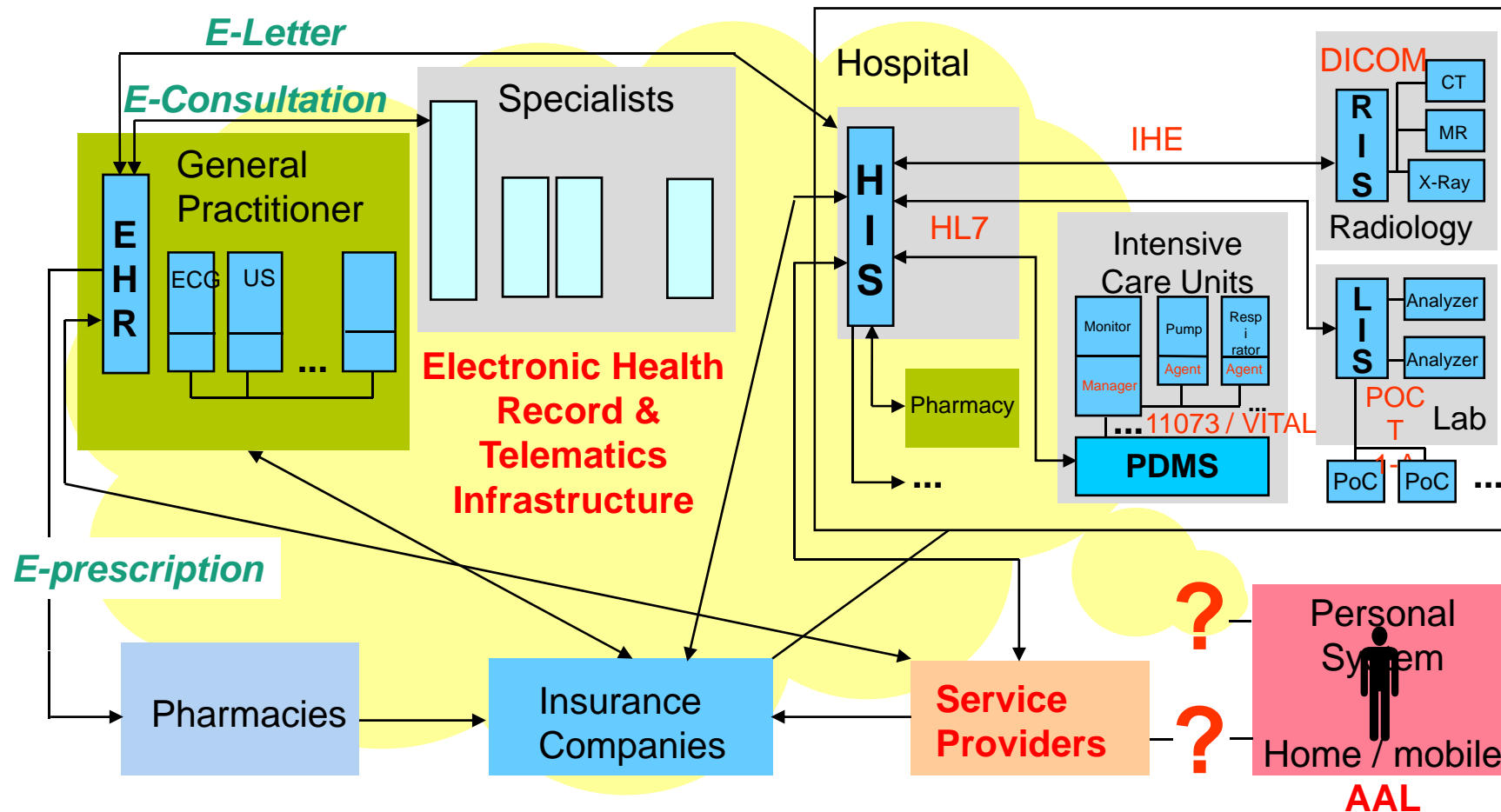
Convergence of AAL, Personal Health and Social Integration (Scope of the Fraunhofer AAL Alliance)



Fraunhofer Alliance »Ambient Assisted Living« (AAL): 13 (out of ~60) Fraunhofer-Institutes cooperate

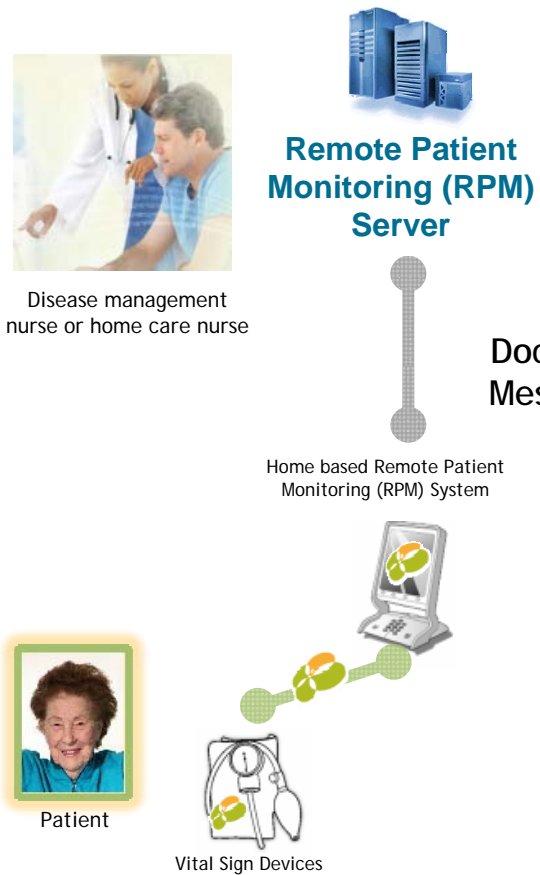


eHealth vs. pHealth / Personal Health / AAL Domains: How to Integrate & Utilize Personal Health Systems?



Continua Version One Healthcare Record Standards

Disease Management Service Provider

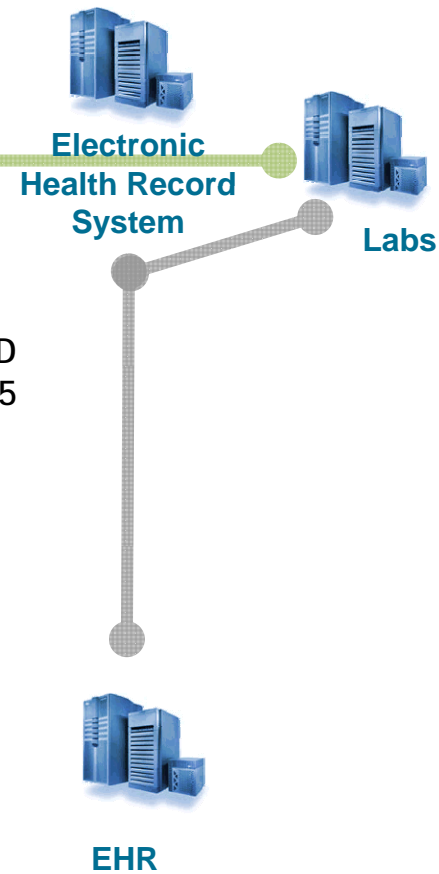


Continua xHR Interface
(Data, Message, Security)



Document Standard: HL7 CCD
Messaging Standard: HL7 v2.5

Healthcare Provider



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Ambient Assisted Living (AAL) & Personal Health:

Additional Options for Personalized Health Care

- AAL and Personal Health characterize recent developments towards individualized application of (medical) technology and medicine.
- AAL, Smart Home and Personal Health domains overlap, they utilize similar technologies, components, infrastructures and services.
- AAL / Personal Health applications for personalized health care require appropriate (health telematics) infrastructures.
- Comprehensive application of agreed semantic and process-oriented interoperability standards is essential.
- Personal Health (and AAL) standards, devices, applications and business models are currently developed on international level.
- AAL and Personal Health systems provide valuable input and feedback options for model-based personalized diagnosis, prevention and therapy.

Thank you for your attention

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