AAL Forum 2010 :

Active Ageing: smart solutions, new markets

The AAL Standardization Scene

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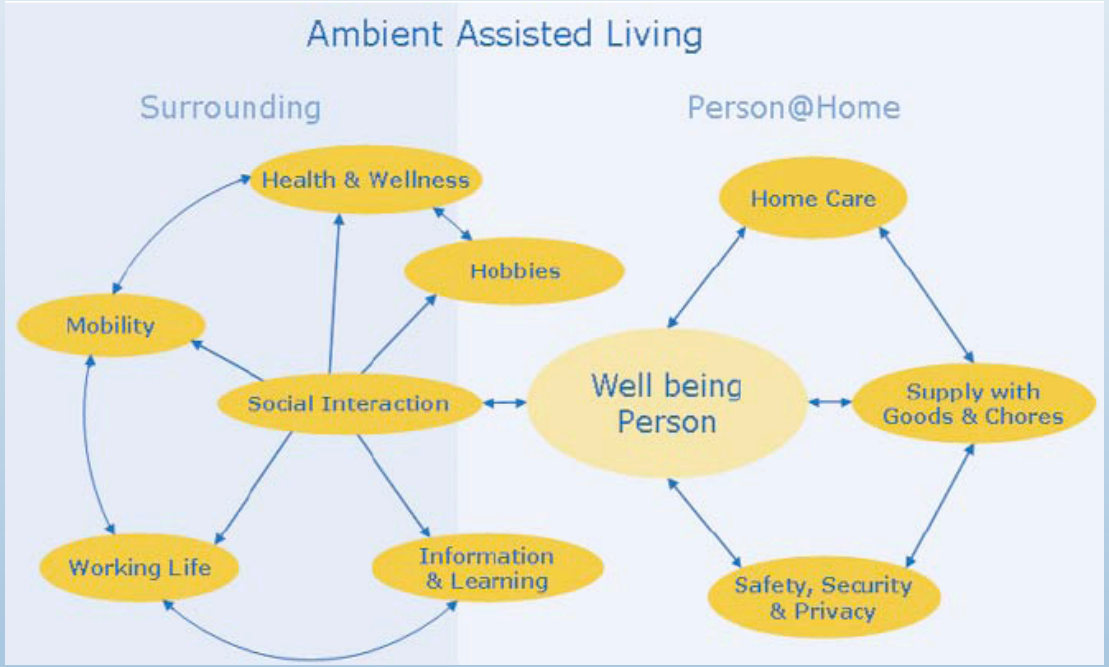
Ambient Assisted Living context

- "Ambient Assisted Living" (AAL) denotes concepts, products and services that interlink and improve new technologies and social systems, with the aim of enhancing the quality of life for all people in all stages of their lives.

- AAL could be best translated as "intelligent systems of a **specific assistance** for a better and safer life in the home environment".



AAL user view

To live independently I need…

…where technology can help a lot

Proactive environmental sensors

Telehealth sensors, medicine reminders

Monitoring of meals, dietary help, Internet shopping

Assistive technology

Electronic carer monitoring

Appropriate response team, proactive calling

Local media, local activities, employment/ occupation

User-friendly communications

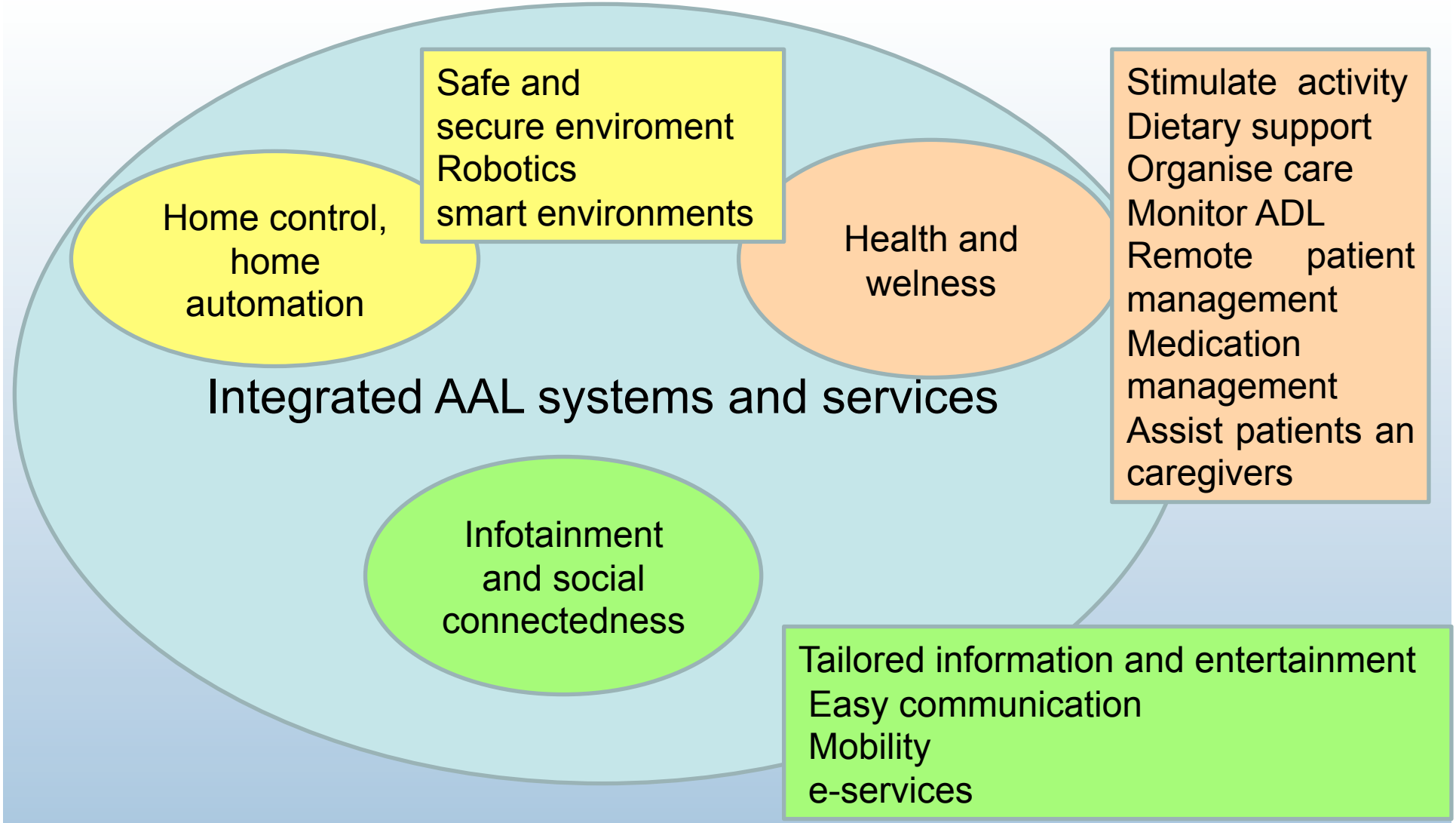
AAL: ICT-enabled assisted living

ICT-enabled assisted living and innovative technological developments

- Home control, home automation and safety (at home and outdoor)
  - Safe (dangerous situations, fall prevention) and secure enviroment
  - Robotics and smart environments
- Health and wellness around a person (home and outdoor)
  - Stimulate physical and mental activity
  - Dietary support, healthy eating
  - Organise care and get help in case of emergency
  - Monitor Activities of Daily Living to detect decline of abilities
  - Remote patient management to prevent relapses of chronic diseases
  - Medication reminders and management
  - Assist patients an caregivers
- Infotainment and social connectedness
  - Tailored information and entertainment
  - Easy communication
  - Mobility
  - e-services e.g. shopping, banking, e-payment, etc

ICT-enabled assisted living

At home and outdoor



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Technologies involved

- Sensing,
  - Intelligent communicating sensors
  - New sensors
- Reasoning
  - Aggregation and processing of sensor data
- Acting
  - Control actuators
- Communication
  - Sensor and actuator networks (on body, in home)
  - Service networks (in home, wide area)
- Interaction
  - Multi modal
  - Adopting to physical and mental abilities of users

Technologies

Sensing

Intelligent communicating sensors
New sensors

Reasoning

Aggregation and processing of Sensor Data, Ontologies, Heuristics

Acting

Control actuators

Communication

Sensor and actuator networks
Service networks

Interacting

Multi modal
Adaptive

Interoperability

Today

- Many stand-alone offerings
  - Home automation/control
  - Household appliances
  - Medical devices
  - Consumer electronics
  - Health information technology
  - Telecommunications
  - …
- Which means:
  - Different standards
  - Different terminology
  - Different products
  - Different markets
  - Different *

Tomorrow?

- What if all that could interact and interoperate?
- A completely new meaning for the term “service”

The need for collaborative services

"Who can deliver a system that integrates the following functions?"

- Infotainment and communications
- Home control (AmI/domotics)
- Monitoring ADLs and physical activity
- Monitoring accidents (most relevant: falls)
- Measuring vital signs like (BP, HR, SpO2, …)
- Medication intake info are collected/reported
- Alert/alarm management: context-coherent calls to the user, to caregivers, to emergency services, depending on the detected type of alert/alarm condition); risk reduction (e.g. automated switch off of hazardous devices); …

A lot of research and agreements on standards is still needed

Interoperability II

- Physical
  - to ensure that products fit together and fit into the environments (incl. mechanical fit)
- Technical/syntactical
  - safe and secure transmission of data. Focus on the conveyance of data, not on their meaning. Includes techniques for data integrity and encryption/decryption

Well understood

agreement on standards and development needed

- Semantic
  - ability of information shared by systems to be understood. Agreement on data content terminology (ontologies, vocabularies), archetypes, data models and templates.
- Process
  - methods for the optimal integration of systems into actual human work settings. Complementarities and dependencies among service components of different services.

Much research still needed

Standards

- **Official standards -** obligatory by by law or regulations. Developed by Standards Development Organisations (SDOs) such as the ISO or the ETSI.
- **Voluntary standards -** developed by SDOs, normally on request from interested parties, but are not mandatory. European Committee for Standardisation (CEN).
- **Industry standards -** defined by one company or a group of companies (e.g. MPEG, CONTINUA). Proprietary, at least initially. For industry standards that become widely used, the notion “de-facto standard” has become common.
- **Open standards -** everybody can participate in their development without being a member of a specific group or institution. Open standards are available to anybody for free or at a low cost; in particular they are patent -free and do not require proprietary software to run.

Standards/interoperability - docs

- Interoperability Working Group of the German BMBF /VDE Innovation Partnership on AAL
  - very detailed study covering the very broad area of AAL in detail
  - very large number of standards identified
  - areas where no standards exist identified
  - challenges to interoperability analyzed

- Report “ICT standards in the health sector: current situation and prospects” (Empirica 2008)
  - Focused on standards in the health sector.
  - Several of them are relevant for AAL (e.g. health tele-monitoring and healthcare at home).

Barriers to standards in AAL

- **Focus on internal efficiency:** AAL application, product and service providers focus on their own needs
- **Standards not designed to user needs:** available standards may not be sufficiently designed to fulfill user needs.
- **Ignorance about standards:** system and service providers may not be aware of existing standards.
- **Implementation/transition costs:** Costs may appear to be too high, particularly with regard to sometimes incompatible updates.
- **Migration costs:** The costs of migrating from proprietary solutions to other applications that support fairly common standards may be too high.
- **Lack of financial incentive** to electronically exchange data with other AAL application and service providers
- **Lack of certification:** potential applicants may lack trust that the standards work properly

Stakeholders for standardization

AAL stakeholders

- **Primary stakeholders:**
  - Clients, Care givers
- **Secondary stakeholders:**
  - service & care providers
- **Tertiary stakeholders:**
  - Suppliers of products, System, technology and infra-structure providers, Educational organizations
- **Quarterly stakeholders:**
  - Payers, policy makers, Standard development organizations

Relevant stakeholders for standardization

- **organizations offering services** to the main target groups, by selecting products and services that comply to certain standards
- **suppliers** of goods, and system, technology and infra-structure **providers** to agree, select and implement standards
- **organizations** to develop standards
- **governments** to mandate standards

Standardization activities

CONTINUA health alliance

- Design guidelines (based on existing standards) for interoperability
- Product certification program with a consumer -recognizable logo.
- Methods for safe and effective management of diverse vendor solutions.
- New ways to address the costs of providing personal tele-health systems.

Standardization effort in RTD

- Many AAL related research projects; several of them have activities related to standardisation.
- Analysis restricted to EU funded projects in the context of 6th and 7th framework program. Exception: NUADA project (ITEA programme).
- Most projects use generic technology standards, only some of them aim at to influencing domain specific standards.
- Interesting project: EASTIN, offering an aggregation of data from six databases from EU countries on assistive products, using the ISO 9999 standard classification.

Lots of important activities

- **CENELEC SmartHouse activities**, the document “SMARTHOUSE PHASE 4 II DRAFT CODE OF PRACTICE” covers the following aspects:
  - Service Provider aspect;
  - content, broadcasting (narrowcasting), DRM and security;
  - Network Operators’ aspect and Broadband delivery;
  - Network Termination and Residential Gateways;
  - customer premises equipment (any electronic appliance or equipment in the
  - home);
  - home networks and in-home communication (and considerations for the building);
  - User Interface, A/V equipment and displays;
  - Consumer (Subscriber), interface and privacy;
  - architectures.

- **Home TAHI Interoperability Framework Initiative** that concentrates on interoperability to define a framework that will support the integration, delivery, use and payment for the applications and services provided; TAHI IFRS document

- The architecture presented by the **PERSONA project**, which builds on results of four earlier EU projects. The architecture covers basic topics like bus systems for communications, service building blocks and ontologies;

- **CONTINUA** that concentrates on the interoperability of health and fitness devices and the communication with application hosting devices in home (later also mobile) and services on the Internet, using existing standards like IEEE 11073 and harmonized with NCCLS/CLSI, HL7, CEN, TC251, ISO TC215, and IHE.

Suggestion: Organization responsible for **certification** of AAL devices and services. Certification would guarantee interoperability of subsystems and allow plug-and-play installation.

Standars for AAL

Process standards:
Functions from services of different sub-domains complementing each other in an integrated solution

Semantic standards like: ontologies, vocabularies, coding systems
Healthcare: tele-monitoring, medication management, care organization
Home control, safety and security
Infotainment and social connectedness
Electronic shopping, ordering and payment

Technical or syntactical standards like:
Connectivity: PAN, LAN, WAN
Web based services, privacy and security technologies
Distributed systems, middleware, message formats

Physical and environmental standards like:
Home and building electronics
Safety, Connectors, frequencies

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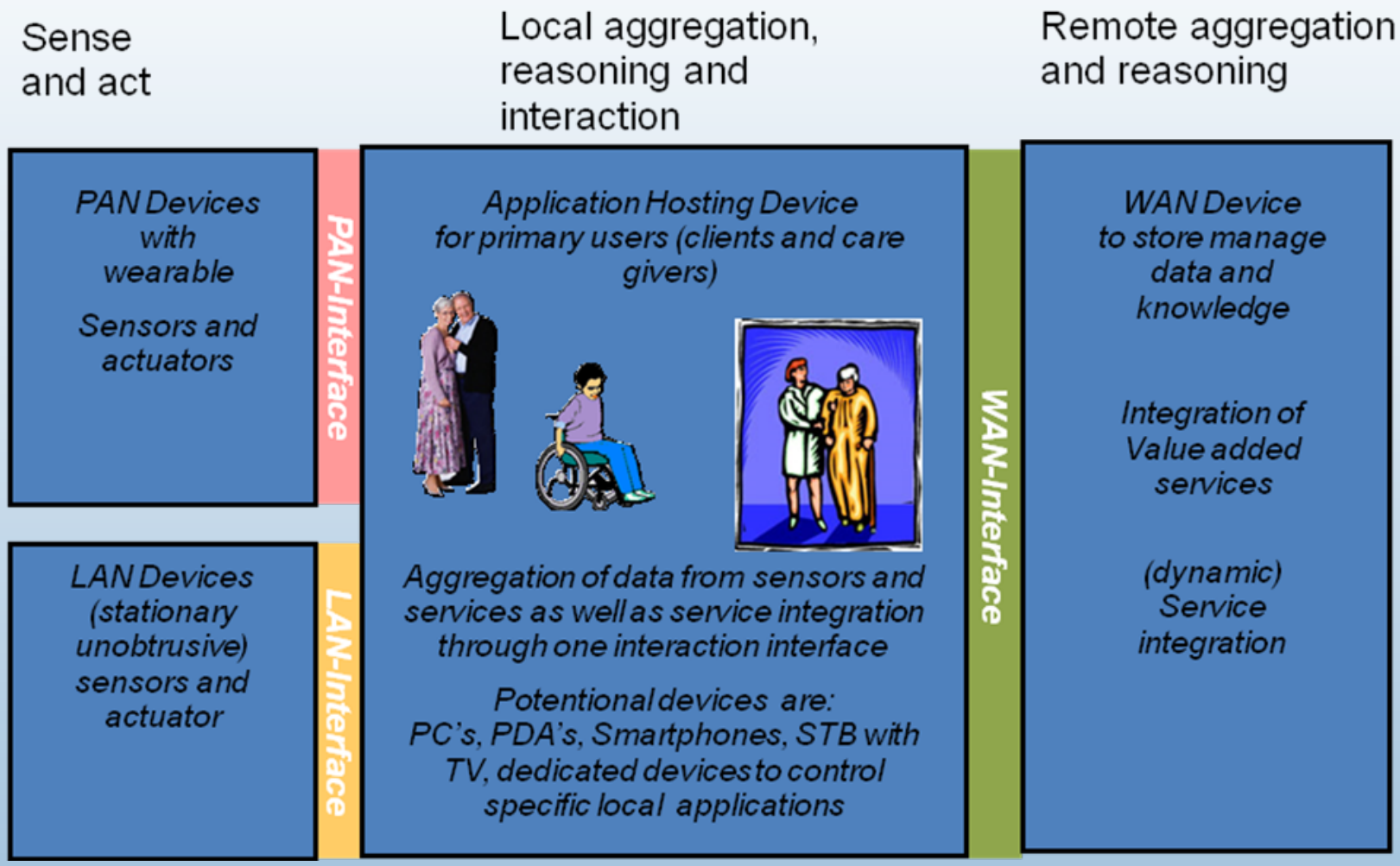
Standards for AAL

Standard and SDO	Category (PHY, TECH, SEM, PROC)	Applicable for architectural component (PD, LD, PI, LI, AHD, WI,WS)
HL7 CCR	SEM	AHD, WS
Cross-Enterprise Document Reliable Interchange (XDR), IHE IT Infrastructure Technical Framework	SEM	AHD, WS
HL7 Clinical Document Architecture, Release 2.0. Health Level Seven	SEM	AHD, WS
HL7 Implementation Guide: CDA Release 2 - Continuity of Care Document (CCD). A CDA implementation of ASTM E2369-05. Health Level 7.	SEM	AHD, WS
SNOMED CT (Systematized Nomenclature of Medicine– Clinical Terms). International Health Terminology Standards Development Organization.	SEM	AHD, WS
Standard Ontology for Ubiquitous and Pervasive Applications (SOUPA)	SEM	PD, LD, AHD, WS
Context Ontology (CONON)	SEM	PD, LD, AHD, WS
Universal Serial Bus Device Class Definition for Personal Healthcare Devices, version 1.0 plus errata. USB Implementers Forum. 8 November 2007.	TECH	PI, LI
ISO/IEEE P11073-10404, Health informatics - Personal health device communication - Device specialization - Contains several sub standards, including a standards for independent living hub	TECH	PD, LD ,AHD
Health Device Profile, version 1.0. Bluetooth SIG. Date TBD.	TECH	PI, LI
IETF RFC 2119, Key words for use in RFCs to Indicate Requirement Levels, S. Bradner, March 1997.	SEM	PI, LI
CENELEC TC 205 (HBES)	PHY	LI
EN 50090 European standard for home and building electronic systems	PHY	LD, LI, AHD
ISO 9001 Quality management systems	PHY	PD, LD, AHD
Immunity (EN 50130-4: 1995 + Amendments) Immunity requirements for Fire, Intruder and Social Alarm Systems	PHY	PD, LD
EN 300 220: 2000 'Electromagnetic Compatibility and Radio Spectrum Matters for Short-Range Devices': This standard defines the EMC requirements for the low-power radio systems used in social alarms.	PHY	PD, LD
ETSI 301 489-1: 2000	PHY	PD, LD ,AHD
ETSI 301 489-3: 2000 EMC standard for Short Range Devices (SRD) operating on frequencies between 9KHz and 40GHz	PHY	PD, LD ,AHD
ETSI 300 220-2 (2007) class 1	PHY	PD, LD ,AHD
EN 50134-1: 2002	PHY	PD, LD ,AHD
EN 50134-3: 2001	PHY	PD, LD ,AHD
HTTP	TECH	AHD, WS
HTML	TECH	AHD, WS
XML	TECH	AHD, WS
ADOBE FLASH	TECH	AHD, WS
SOAP	TECH	AHD, WS
RDF	TECH	AHD, WS
OWL	TECH	AHD, WS
OSGI	TECH	AHD, WS

IEEE 802.11 (a,b,g,n)	TECH	LI
IEEE 802.15 (1,3a,4,6)	TECH	PI, LI
WIFI	TECH	PI, LI
BLUETOOTH	TECH	PI, LI
ZIGBEE	TECH	PI, LI
Z-wave	TECH	PI, LI
UWB	TECH	PI, LI
RFID	TECH	PI,LI
UPnP	TECH	PI, LI
DPWS	TECH	PI, LI
LonWorks	TECH	LI
X10	TECH	LI
KNX	TECH	LI
INSTEON	TECH	LI
Home plug Alliance	TECH	LI
GSM	TECH	WI
SMS	TECH	PD. AHD, WS
IMS (2008)	TECH	PD. AHD, WS
GPRS	TECH	WI
UMTS	TECH	WI
WMAX	TECH	WI
HSPA+ (2009)	TECH	WI
LTE (2010)	TECH	WI
Mobile Broadcast Multicast Service MBMS (2008)	TECH	WI
DVB-H (depends on the country)	TECH	WI
Mobile NFC (2009)	TECH	PD, LD, AHD
Web Services Description Language (WSDL)	TECH	AHD, WS
Web Service Modelling Language (WSML)	TECH	AHD, WS
WSMO – Web Services Modelling Ontology	TECH	AHD, WS
Semantic Web Services Framework (SWSF)	TECH	AHD, WS
Semantic Web Services Language (SWSL),	TECH	AHD, WS
Semantic Web Services Ontology (SWSO),	TECH	AHD, WS
GPS	TECH	PD, AHD
AFNOR (privacy)	TECH	AHD, WS
ISO guide 76 safety	TECH	PD, LD, AHD
ISO 9241-11 (1998): usability	TECH	AHD
Object Naming Service (ONS) Standard	TECH	AHD, WS
EPCIS - EPC Information Services Standard	TECH	PD, AHD, WS
EN 50134-2: 1999 (trigger device)	TECH	PD, LD ,AHD
The Unified Code for Units of Measure, Gunther Schadow, Clement J. McDonald, 1998-2008.	TECH	PD, LI, AHD,WS

Analysis

The AALIANCE reference architecture for AAL



Analysis I

- **Systems for a specific purpose operating in a standalone mode** have **no need for additional standards** beyond the available standards for to environmental (e.g. EMC), quality (ISO 9001), safety, physical product properties (e.g. CE norms), manufacturing and installation processes.

- The **goal of AAL** however is **to come to interoperable systems** that can work together and from the view of the users presented as an integrated system. To realize this interoperability **standards in the following areas** are needed:

Analysis II

- **Connectivity and protocols**
  - For PAN, LAN and WAN multiple alternatives exist. For an approach where multiple products, application and services have to collaborate choices have to be made. **CONTINUUM** for example has made for their **version 1 specification** the choice for **Bluetooth, USB and WiFi**.
  - **Products in the personal area network or local area network might still have an alternative or even proprietary technology** as long a gateway interface compliant with connectivity standards to PAN or LAN is provided. *E.g.:home control unit with X10 interfaces to sensors or switches and WiFi interface to an application hosting device*

Analysis III

- **Data exchange**
  - The **exchange of data** is very important when systems and services have to **collaborate to enable workflow support between different tasks** not only for the clients but certainly for the care givers in a trans-mural setting.
  - To enable usable data exchange, agreements on **messaging formats** and **data models within the message** are important. In the healthcare domain, also for tele-monitoring, standards are available but are not used everywhere; interoperability and integration in a home environment is still a big issue. **In other domains**, like home control, safety, and alarm systems **this kind of standards is lacking.**
  - A lot of work has still to be done in this area both in research as well as increasing acceptance.

Analysis IV

- **Understanding of data**
  - The **understanding of each other's data** is also very important to enable workflow support between different tasks.
  - To understand data: **vocabularies**, **unit codes**, and **ontologies** have to be defined. AGAIN, **for the healthcare domain such standards are available**, however they are **not used everywhere. In other domains**, like home control, safety, and alarm systems **standards are still lacking**.
  - A lot of work has still to be done in this area both in research as well as increasing acceptance.

Analysis V

- **Dynamic configuration of systems and services**
  - In the area of PAN and LAN networks the dynamic configuration of systems is important because people are moving through a home or even outdoor, so not all systems might be in reach all the time. This requires facilities for **auto-configuration, registration and discovery**. Choices have to be made here with respect to which technologies to use. Within **CONTINUA** version 1 specification the choice for **UPnP** has been made.
  - In the area of Web-based services a lot of standards exist; choices have to be made.

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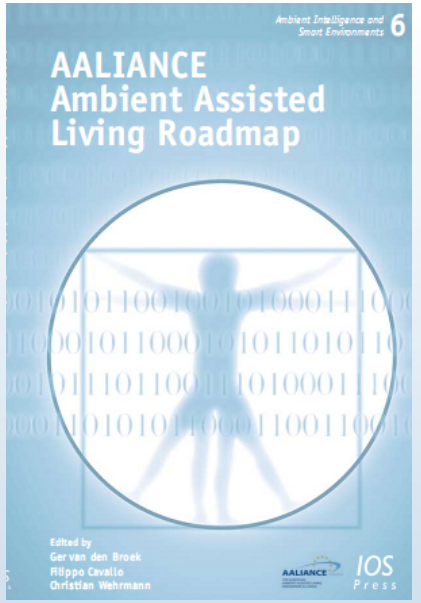
Recommendations

- **Increase the awareness on existing standards** e.g. by translating and spreading selected existing publication in non-english language
- **Demonstrate the advantage** of collaborative and integrated applications and services based on using standards
- **Develop and promote a reference model** that gives guidance to product and service developers.
- **Develop and promote design guidelines and a certification process** for AAL products and services. This should be based on identification, selection and promotion of existing standards, and gaps should be identified and filled.
- **Move beyond syntactical interoperability to semantic and process levels**. Stimulate research to develop standards for the AAL context in the semantic and process interoperability levels.
- **Don't leave non-health domains orphans**: interoperable solutions for the areas of proactive safety, assistive applications and social community services still need to be explored.

- **AALIANCE**: FP7 Coordination action (CA) ICT and Aging 01/2008 – 03/2010
  - AAL Roadmap (published by IOS Press, March 2010)
  - **AALIANCE Report on Standardisation Requirements*, ****
  - AALIANCE Policy Recommendations*
  - AAL Strategic Research Agenda*



** Documents available at the AALIANCE website:*
http://www.aaliance.eu/public/documents

*** Edited by Ger van den Broek, Philips*

Thank you for your attention

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