Integration Profiles: an Approach for Cracking the Interoperability Challenge in AAL

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2 Introduction: „Future-proof" AAL Systems

- ▶ AAL systems are complex and (relatively) expensive: They
  - ▶ combine products and components from various industrial sectors;
  - ▶ need an "ecosystem" of service providers for planning, installation, maintenance, operation and service provision;
  - ▶ must be "future-proof", i.e. can be extended and maintained over time, growing and adapting to the changing needs of the user.

- ▶ We need **modular** solutions
  - ▶ where components can be combined in a flexible manner (think: Lego blocks);
  - ▶ with standardized & interoperable interfaces.

- ▶ **Interoperability:** a key requirement for the success of AAL solutions on the market.

- ▶ **So the question is: How do we achieve modularity and interoperability?**

3 The Role of Standards for Interoperability

Source: Wikimedia

▶ Standards are an important building block for achieving interoperability,

▶ However, standards are not sufficient:

  ▶ Many standards must be combined do completely cover a certain use case. Which ones?

  ▶ There are competing standards for the same use case (e.g. home automation). Which one should we choose?

  ▶ Standards have many optional features or alternatives. Which ones to use?

▶ What we need is a "cookbook" that explains how to implement a certain AAL use case with interoperable, standards-based systems and system components!

▶ This is called an **"Integration Profile"**.

4 Integration Profiles

- ▶ Integration Profiles
  - ▶ Start with an **application scenario** (use case) from an end-user perspective;
  - ▶ Describe the required **systems and components** ("actors");
  - ▶ Identify **interfaces and interactions** between the systems/components ("transactions");
  - ▶ Map interfaces to existing **communication standards**;
  - ▶ Describe standard **options** and alternative implementation approaches
  - ▶ Describe **security** requirements and **ethical & legal** considerations

- ▶ The result is an **implementation guideline** for modular AAL systems and components than can be integrated and can interoperate seamlessly.

5 AAL-JP Support Action on Standards and Interoperability

▶ The project has analyzed more than 300 use cases from AAL-JP, FP6 and FP7 AAL projects, and worked out the most common "themes".

▶ On this basis, seven integration profiles for AAL have been developed:

  ▶ **Behavior Monitoring:** recognition of ADLs and emergency situations
  ▶ **Calendar Service:** reminder service that tries to keep the user active
  ▶ **Social Interaction with Smart TV:** voice, video, chat, social networks etc.
  ▶ **Shopping and Nutrition Planner:** supports the user in planning healthy nutrition and both outdoor and online shopping
  ▶ **Mobility Assistant:** indoor & outdoor navigation and emergency calls
  ▶ **Personal Trainer:** tracks physical activity and creates personal training plan
  ▶ **Environmental Health Monitoring And Alarms At Work:** monitors behavioral and environmental hazards at the workplace.

▶ Results are public, to be published on AAL-JP website aal-europe.eu

6 How does it look like?
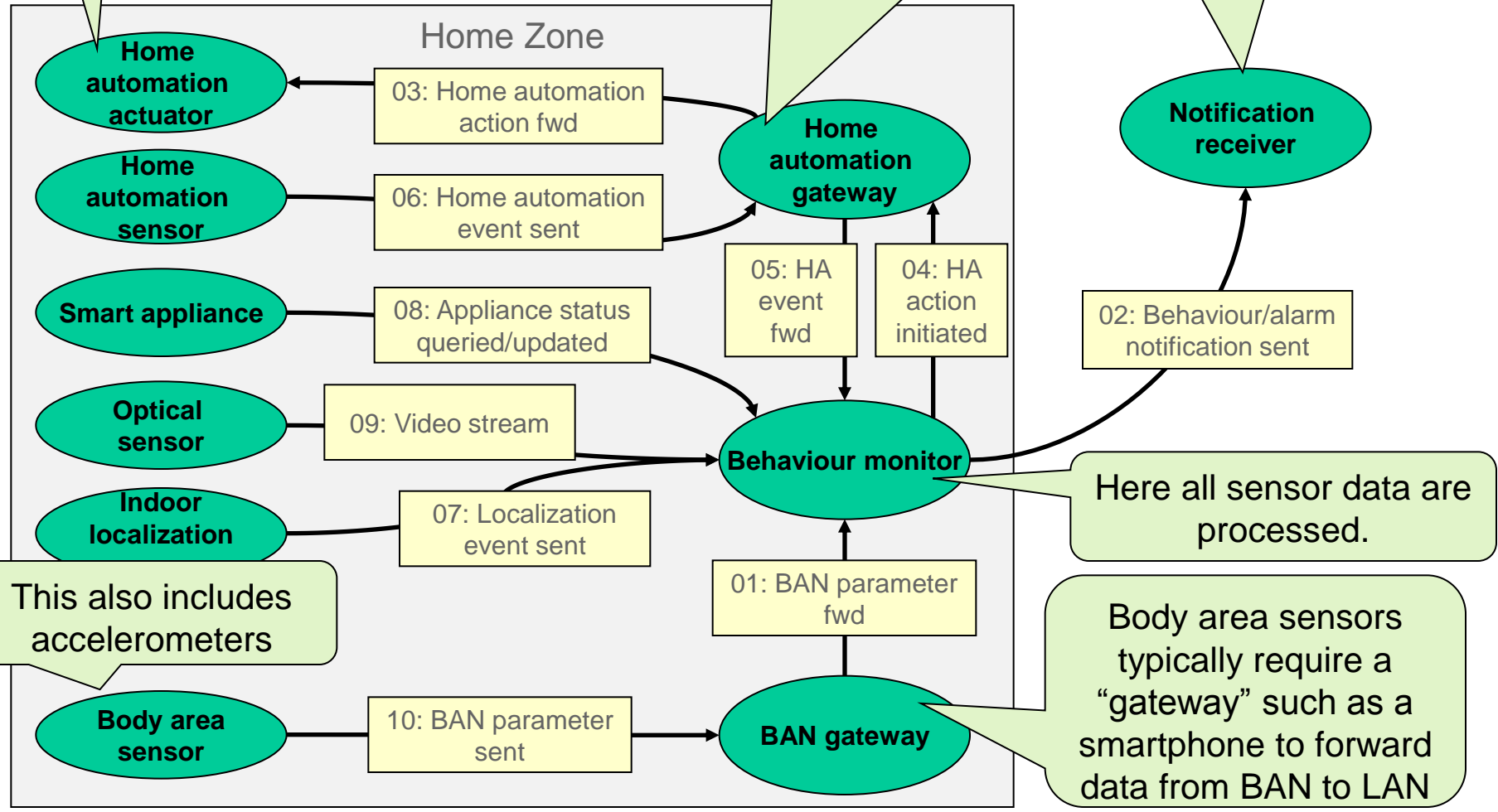## Behaviour Monitoring Actors and Transactions
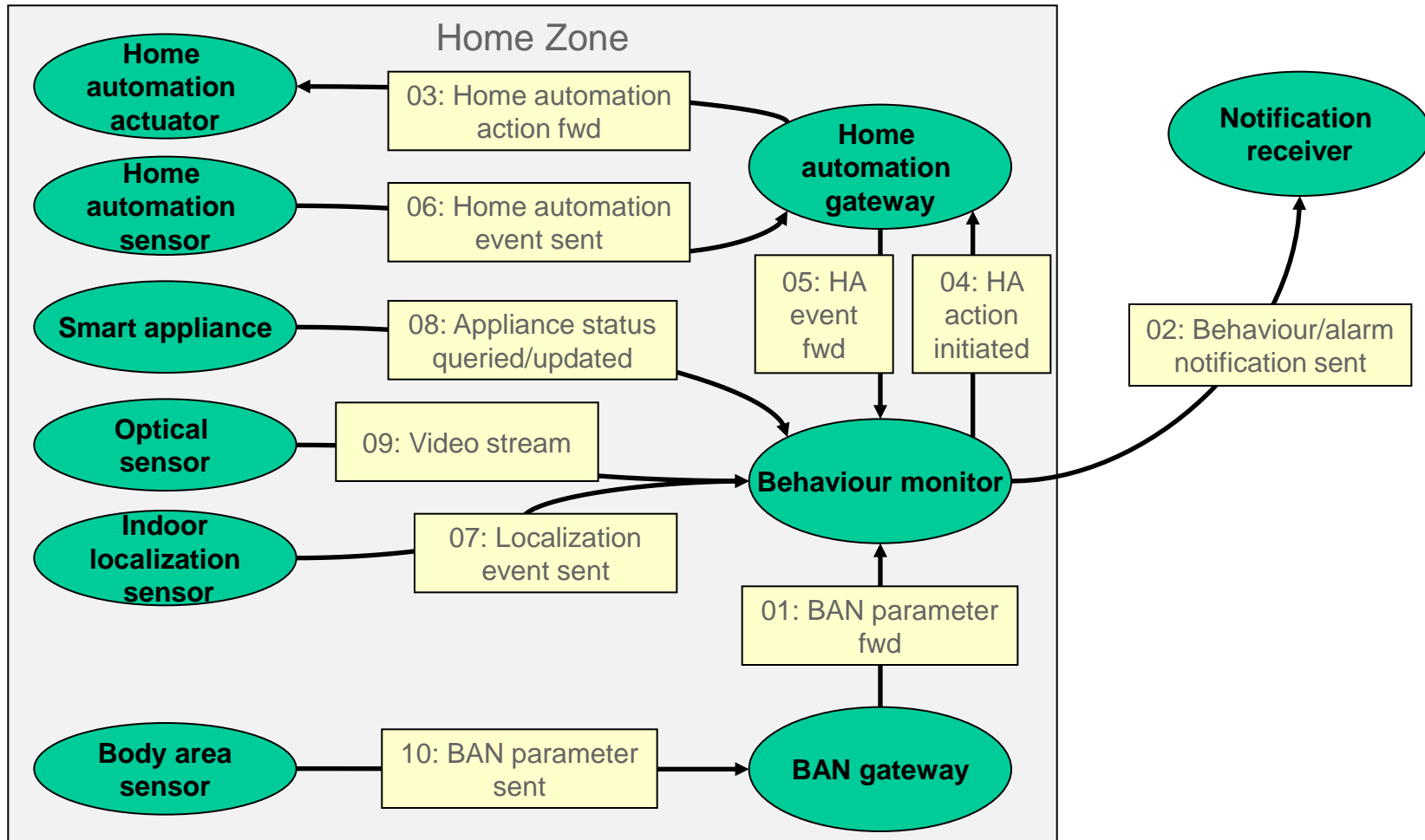
Actuators: Lighting and Shutters

Since there are so many home automation networks, we foresee a gateway that maps events and commands from a network-independent format to a network-specific protocol.

Notifications to carers are the only transaction leaving the home zone

Home Zone

Home automation actuator

03: Home automation action fwd

Home automation sensor

06: Home automation event sent

Home automation gateway

Notification receiver

05: HA event fwd

04: HA action initiated

02: Behaviour/alarm notification sent

Smart appliance

08: Appliance status queried/updated

Optical sensor

09: Video stream

Behaviour monitor

Here all sensor data are processed.

Indoor localization

07: Localization event sent

This also includes accelerometers

01: BAN parameter fwd

Body area sensors typically require a "gateway" such as a smartphone to forward data from BAN to LAN

Body area sensor

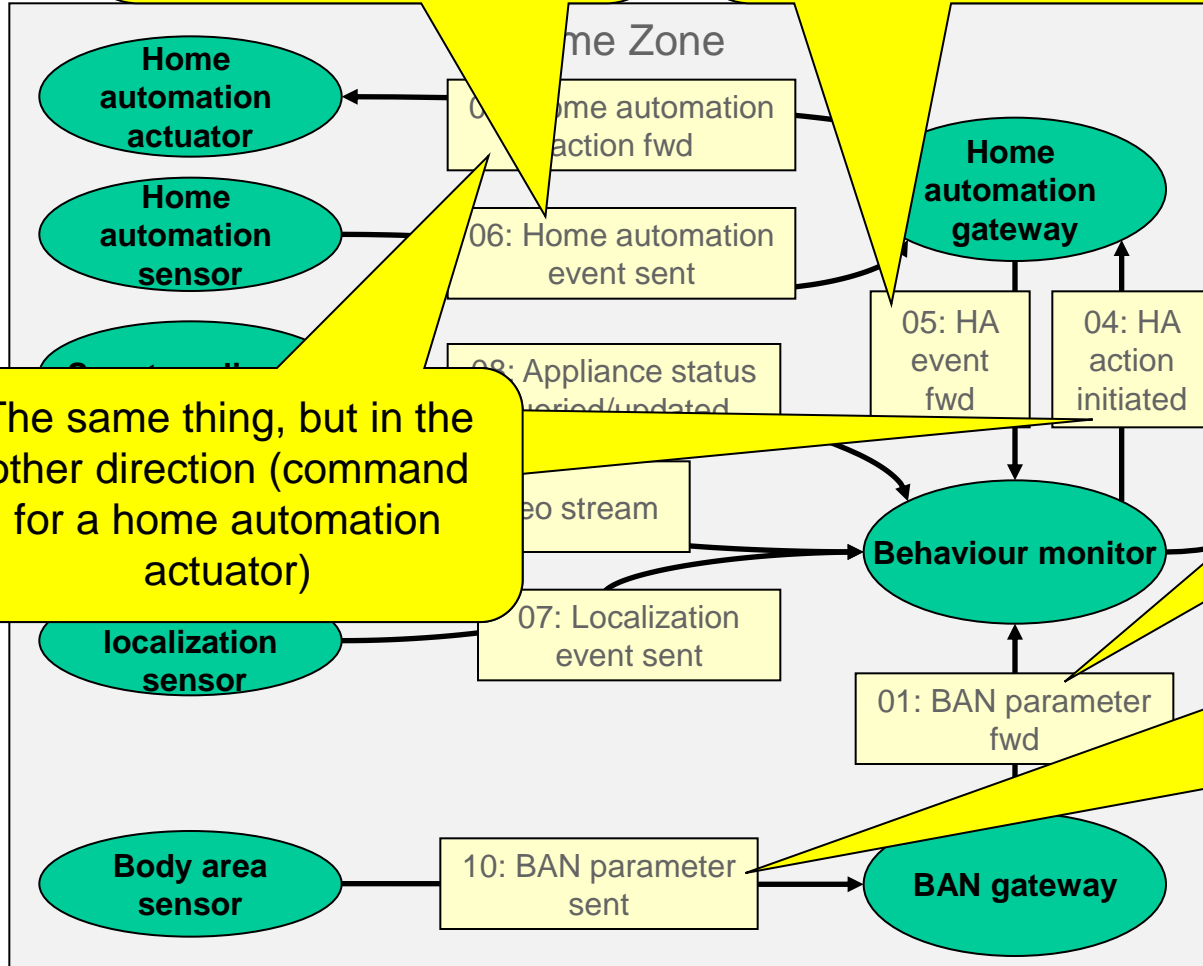10: BAN parameter sent

BAN gateway

8 H

Be

A home automation sensor generates a measurement and sends it using KNX (cabled) or ZigBee (wireless) to the home automation gateway

The home automation gateway "translates" the event to a hardware-independent protocol (UPnP or universAAL) and forwards it to the behaviour monitor

The BAN gateway "translates" the event to a hardware independent protocol (HL7v2 or universAAL) and forwards it to the behaviour monitor

The same thing, but in the other direction (command for a home automation actuator)

A body area sensor (e.g. accelerometer) sends a measurement to the BAN gateway (smart-phone) using Bluetooth HDP, LE, or USB

me Zone

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localization sensor

Body area sensor

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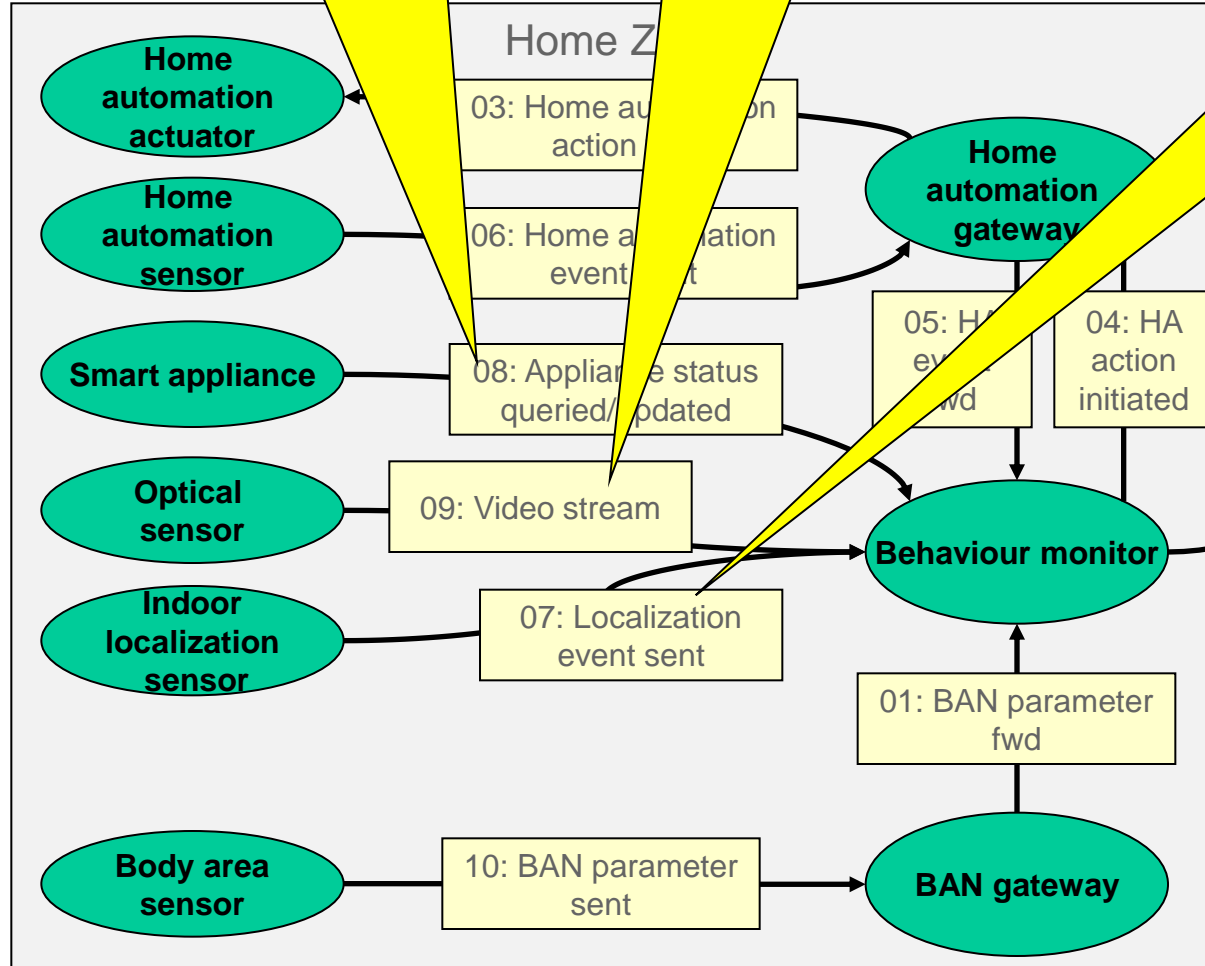**Behaviour Monitoring Actions and Transactions**

A smart appliance sends a status update to the behaviour monitor using CHAIN AIS (EN 50523) over Powerline

An optical sensor (camera) sends a video stream to the behaviour monitor according to the ONVIF specification (RTP/RTSP)

An indoor localisation system (e.g. floor mat) sends a new location event. Web Service based on GPS Exchange Format.

Home Zone

- Home automation actuator
- Home automation sensor
- Smart appliance
- Optical sensor
- Indoor localization sensor
- Body area sensor

- Home automation gateway
- Behaviour monitor
- BAN gateway
- Notification receiver

03: Home automation action

06: Home automation event sent

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The behaviour monitor sends an alarm or notification message to an external receiver using SCAIP. Voice or video communication can be established if supported by both sides.

- ▶ Integration Profiles: an approach for "cracking" the interoperability challenge in AAL.
  - ▶ Start from end-user perspective, derive actors, transactions, standards.
  - ▶ Requires agreement on what are the most important use cases to be "standardized"
  - ▶ Requires very detailed work by technical experts
    (the "Behaviour Monitoring" profile is 45+ pages, and could be much more)
  - ▶ The approach has very successfully been used in eHealth for 15+ years.

- ▶ Integration Profiles are useful for vendors and for users
  - ▶ Vendors: can develop interoperable, compliant products/components that can be easily integrated with other products following the same guideline
  - ▶ Users: can use integration profiles as part of the procurement process and thus ensure "future-proof" and technically mature solutions

- ▶ The AAL-JP support action has shown that Integration Profiles are possible in AAL. Now it is up to the community to devise the next steps.

Thank you for your attention

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