OPEN PLATFORM AND REFERENCE SPECIFICATION FOR AAL

Relevance of the EU FP7 project universAAL for IEC SG5

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OVERVIEW

AAL: Yet another Name for eHealth / Telemedicine?

The universAAL Project & its relevance for IEC SG5

Highlights from the universAAL Platform

Ambient Assisted Living

A definition: ICT for intelligent living environments that react to the needs of their inhabitants by providing relevant assistance

- Assistance in life…
  - Health
  - Safety and security
  - Daily activities: personal hygiene, home cleaning, shopping, cooking, …
  - Comfort & entertainment
  - Social integration
  - Mobility
  - etc.
  - ➢ Overlap with several other disciplines, such as
    - ➢ Ambient intelligence
    - ➢ eHealth / Telemedicine
    - ➢ Home Automation / Energy efficiency

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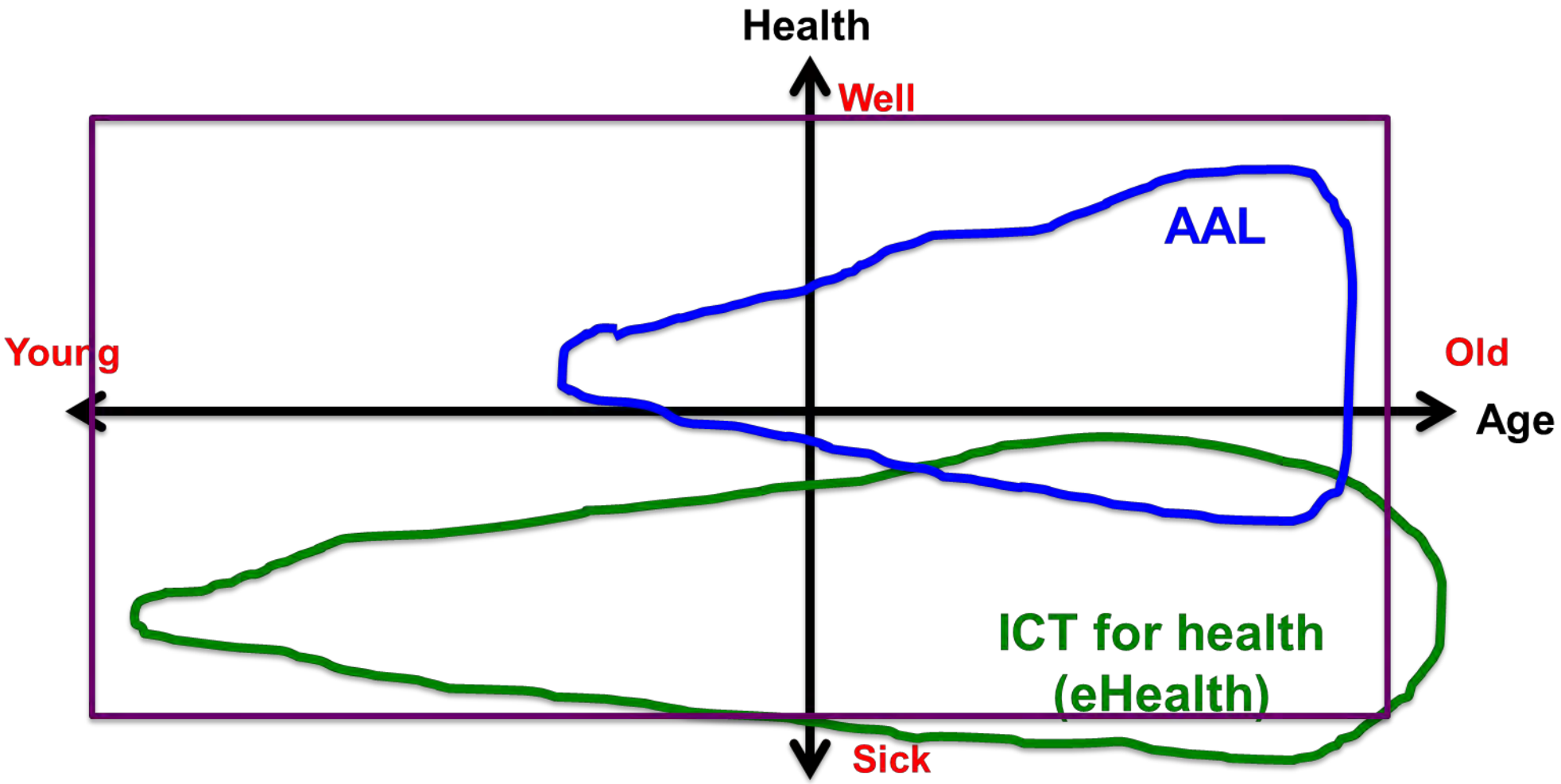
A possible view



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The AAL Puzzle (I)

No major success stories despite the following facts:

- There is the need, e.g.
  - Ageing populations escalate costs for the related social systems
- There is the market potential
  - Demand: a growing population in a main segment of customers
  - Supply: possibility for a large variety of applications
  - E.g., EC says: Europeans over 65 have a revenue of over € 3000 billion
  - E.g., EC says: Market for smart home applications to triple until 2020
- There is socio-political support
  - AAL is already a major topic on the Digital Agenda of the EC
  - Still new initiatives start, e.g.
    - The EU JPI “More Years, Better Lives”
    - The EU Innovation Partnership on Active & Healthy Ageing (EIP-AHA)

The AAL Puzzle (II)

Market breakthrough for AAL certainly more challenging than for eHealth:

- There is no killer app, it's about an evolving open distributed system
  - Simple use cases do not demonstrate the potential of AAL very well
  - Intelligent reaction to needs necessitates more complex settings
  - ➢ Lack of interoperability standards turns very quickly to a barrier
- An evolving system cannot be bound to few certain business models → it is not clear who should invest on creating showcases and related advertisement
- There is a gap between R&D and the market
- Technology and operation cost is not sufficiently low for attracting investment on creating products and services that stimulate the market
- Large enterprises do not invest in the absence of a stable ecosystem which guarantees RoI
- SMEs are not able to invest in the absence of a stable ecosystem giving them the chance to survive

The Lecce Declaration on AAL Market Breakthrough

A community activity organized by the AAL Open Association (AALOA.org) on the occasion of the AAL Forum 2011, in Lecce, Italy

Signed by over 200 organizations involved in consortia of 44 different AAL projects

self-organizing ecosystems emerge around common open platforms
→ a call towards **common open platforms for AAL**

9 measures proposed as possible steps to achieve the above goal, e.g.

- provide coherent views on AAL systems by promoting the convergence of similar results into established and reusable concepts
- put *competing technological enablers* under stress test in real-life conditions to assess their usefulness, usability and reliability

➢ Basically, calling for co-opetiton – collaboration among competitors – in order to achieve commoditized infrastructures

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universAAL – UNIVERsal open platform and reference Specification for Ambient Assisted Living

Under Objective 7.1b of FP7-ICT-2009-4:

Consolidation of cutting-edge R&D results towards a reference open and cross-application platform for AAL

universAAL Main Objective

To make it technically possible and economically feasible to design and deploy innovative AAL services

Providing an **open platform** that facilitates the development and deployment of AAL services

Strength through inclusive approach:

1. Consolidate & extend free & open results of successful projects
2. Provide free & open results
3. Ensure sustainability by initiating support activities (e.g. open source community) early in the project

* **Duration: 48 months**
* **Start: February 2010**
* **Budget: 13.9 M€**
* **EU Funding: 10.5 M€**

Supporting a holistic view on the AAL eco system

Developers Depot

Free resources and code samples to develop innovative AAL Services

uStore

A global marketplace for vendors and a one-stop-shop for buyers of AAL services

AAL Showroom

Discover what our platform can do for you and your business

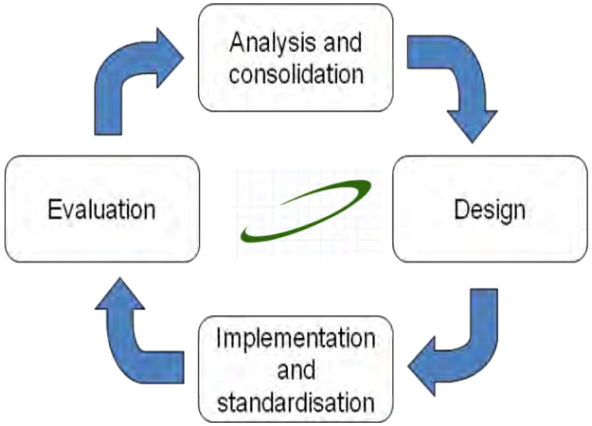
One way to build them all,
One way to bind them,
One store to save them all,
And help the users find them

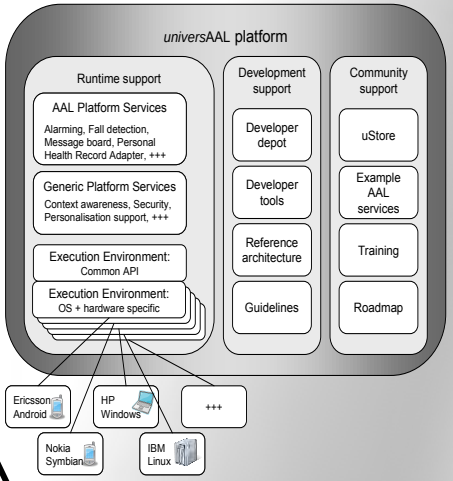
Mandate: Consolidating State-of-the-Art in one platfom for AAL

Amigo Mpower Persona Oasis Any

AAL developer community

End users





Continua HEALTH ALLIANCE

OMG OBJECT MANAGEMENT GROUP

IEC European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Open Health Tools

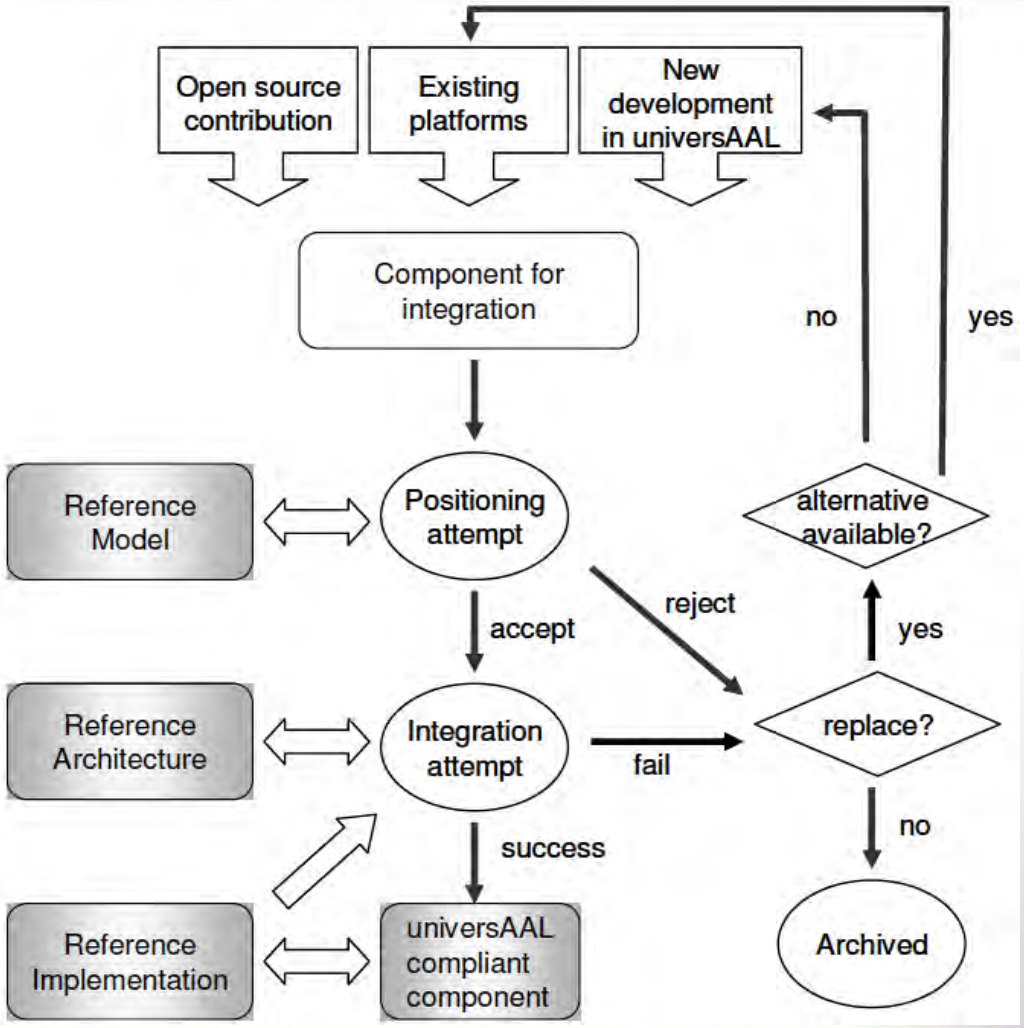
universAAL

Consolidating state-of-the-art

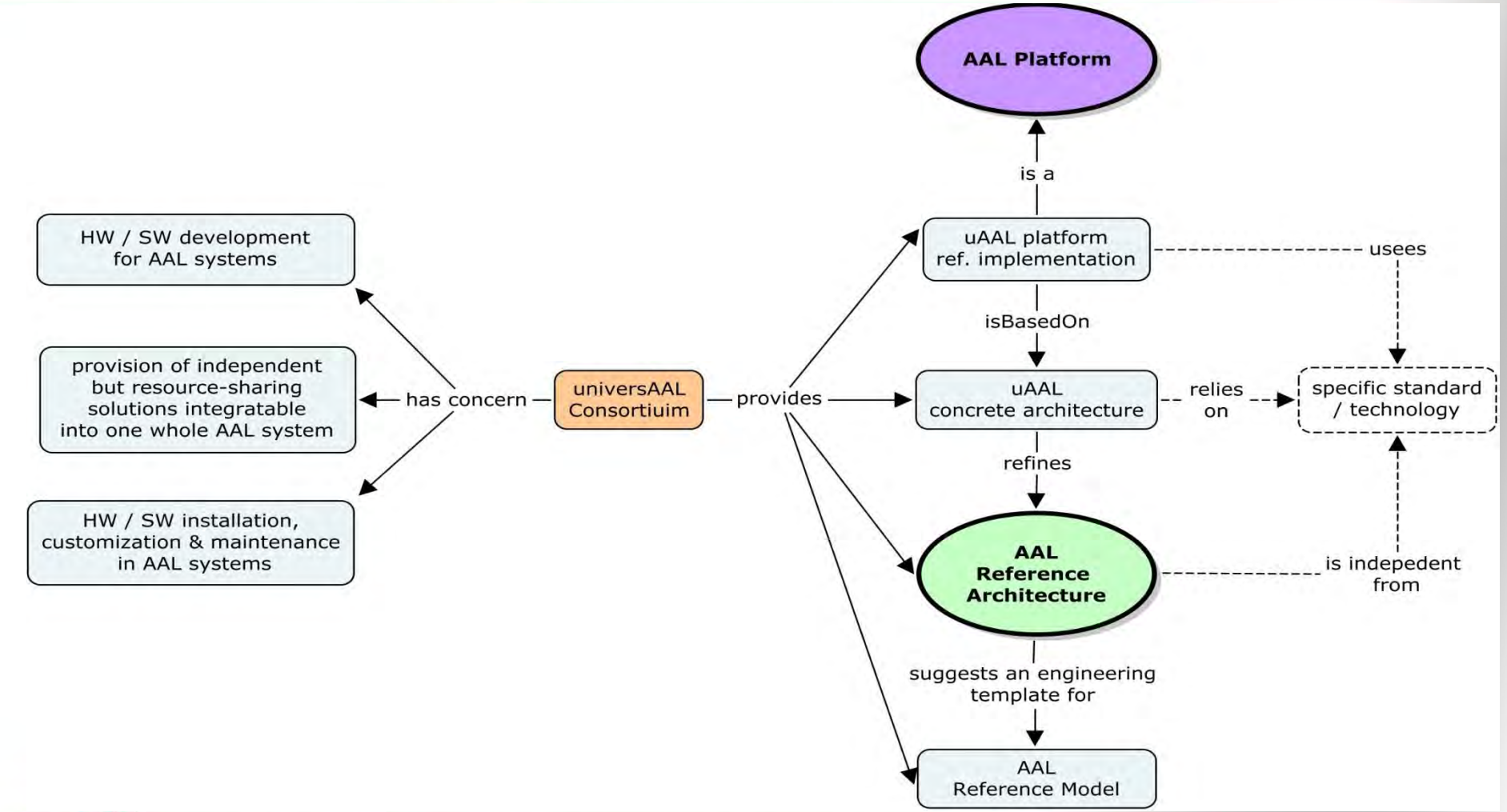
Apache License 2.0

publically available

project main results



How do the results relate to each other



Standards and Standardization in universAAL

- A dedicated task (T8.3 Standardization) within a project work-package (WP8 Community building & Standardization)
- Two way strategy
  - Use of existing standards
    - A deliverable has analyzed the scene and made a prioritized set of concrete recommendations → D8.3
    - The concrete architecture as well as the reference implementation of an AAL platform have to consider those recommendations
  - Contribution to standards
    - Possibilities: improvement of used standards and / or creation of new ones
    - A dedicated task (T1.5) responsible for technical support → started 6 months ago

Possible contributions to AAL Standardization

Formal through participation in standardization bodies

- The universAAL reference model for AAL
- The universAAL reference architecture for AAL
  - based on a set of reference use cases and reference requirements
- A set of concrete specifications in different areas of interoperability

Informal

- The reference implementation as de facto “standard”
  - Plan: AAL communities (in particular AALOA) takes over the further development and maintenance
  - Vision: AAL community creates a standard specification for smart environments (like what POSIX is for operating systems) out of the above reference architecture and its reference implementation

Finding the right standardization body

- There is a wide diversity of potential topics relevant for AAL standardization with a high degree of overlap with many existing standardization bodies and technical committees

- There is need for a coordinating body that
  - Determines about standardization priorities
  - Coordinates parallel activities and leverages synergies between them
  - Identifies gaps and arranges for filling them

- IEC SG5 is probably the best match for this role!

Means for the success of AAL standardization

- A standardization roadmap
  - The DKE roadmap for AAL standardization is already on the table
  - The universAAL deliverable D8.3 might also help, at least for comparison purposes
- Additionally, to leverage the roadmap to the level of an action plan
  - A reference model can help to better position roadmap items (from the long list of relevant standardization activities) and determine about their priorities
  - A reference architecture can help to better delegate concrete standardization tasks, coordinate them, and leverage synergies

➢ Standardization at the level of a reference model and reference architecture should be part of the work in SG5 itself

- Related universAAL results here can serve as an initial input

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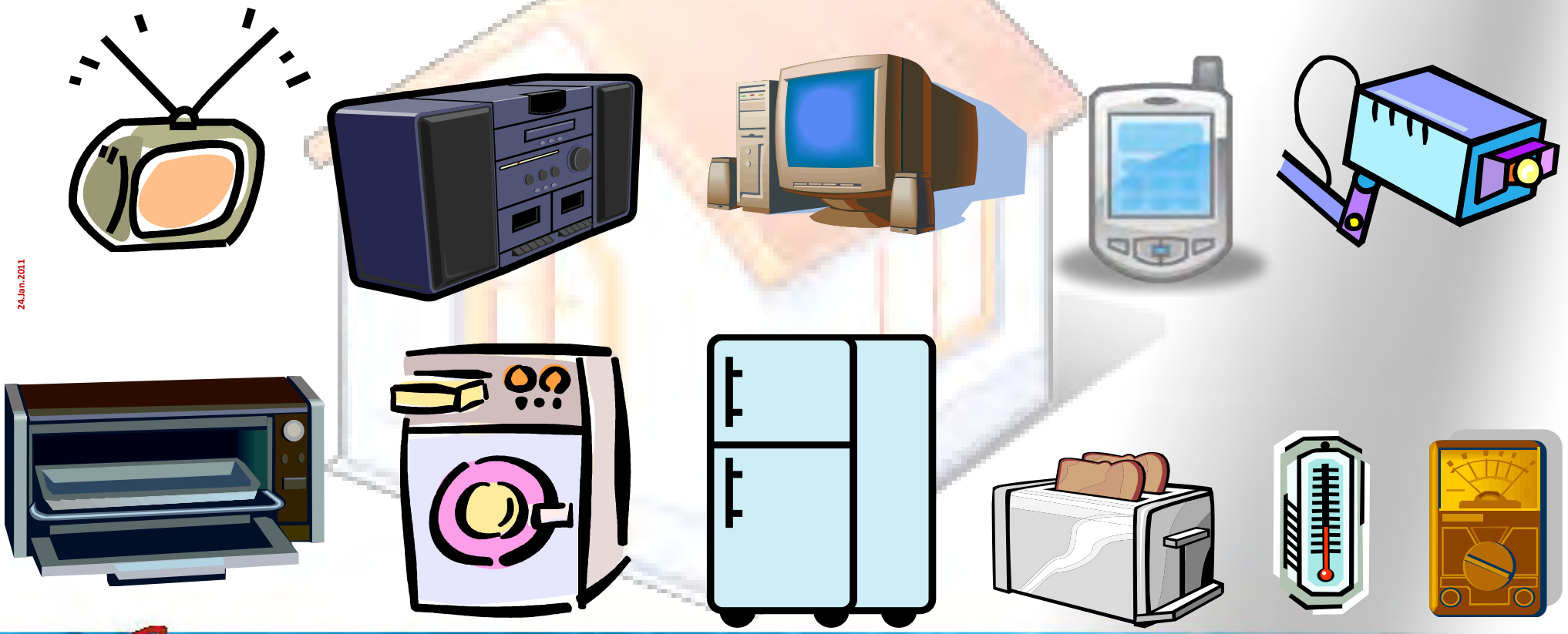
An Analysis Of Challenges

AAL Spaces: smart environments providing AAL Services

The challenge – running applications on multiple heterogeneous devices



The Interoperability Challenge

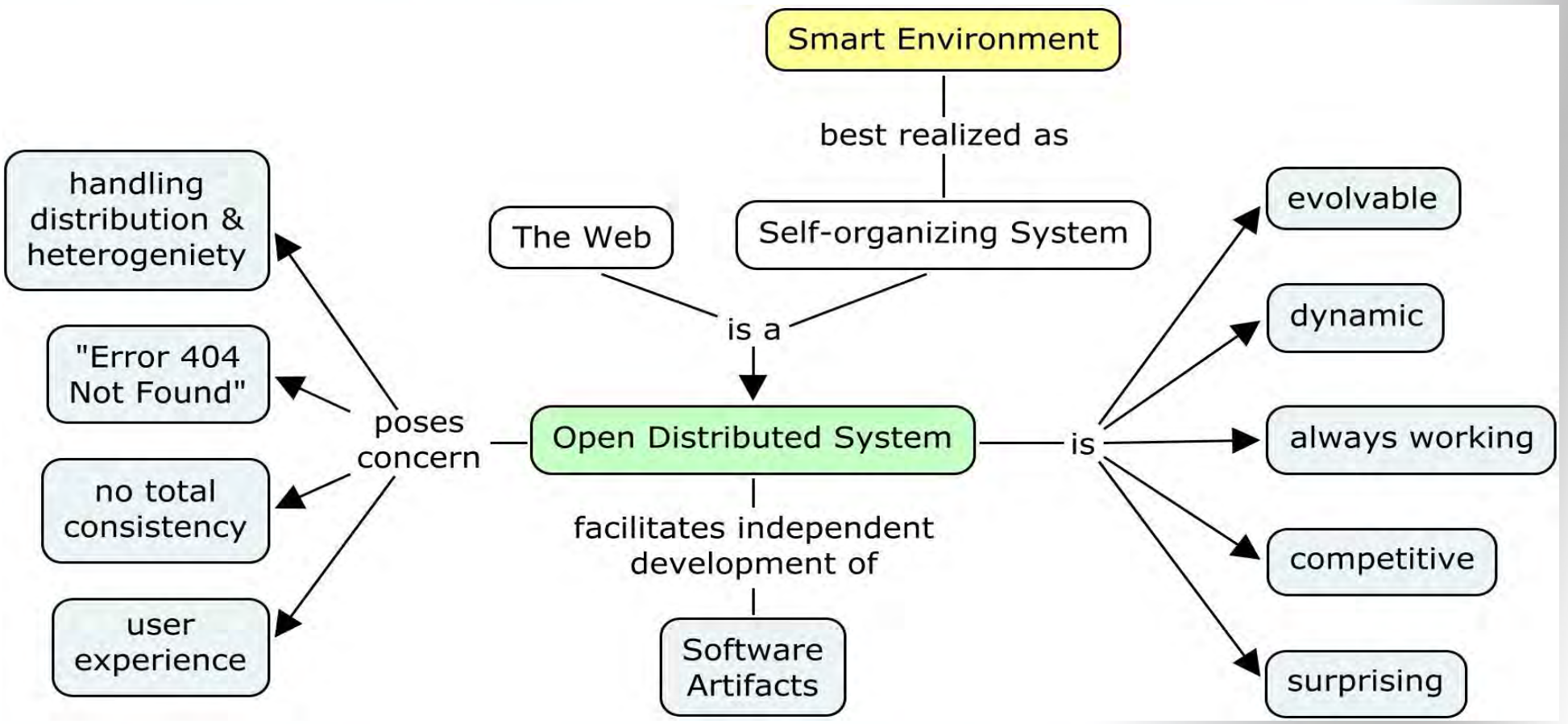
- Independent development / production
- Ability to exchange data & functionality
  - Networking protocol
  - Access protocols
  - Data representation

- Several application domains
- Several standards per app domain
- Several application profiles per standard
- What to do, when all relevant (like in AAL)

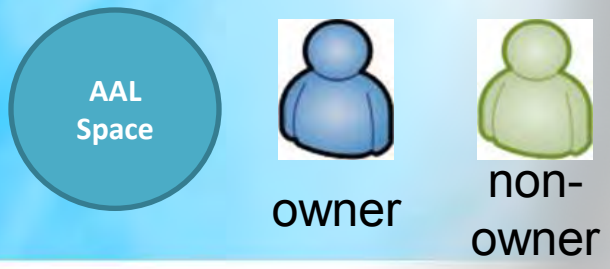
Possible answer to interoperability challenges

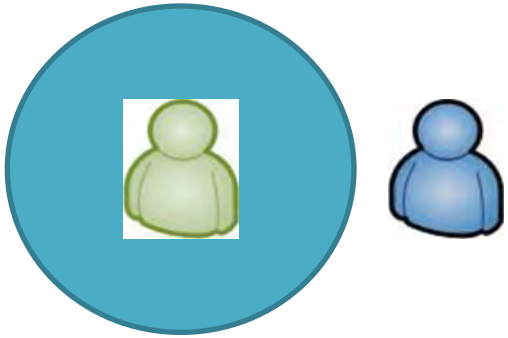
- A main protocol for networking & communication, optimally based on a single solution for data representation
  - "AAL" components versus legacy components
- Integration of legacy components through adapters
  - Networking level: protocol-specific gateways
  - Access methods and data representation: component-specific proxies
- Such solutions are called middleware solutions
- A good reference: http://sardes.inrialpes.fr/~krakowia/MW-Book/

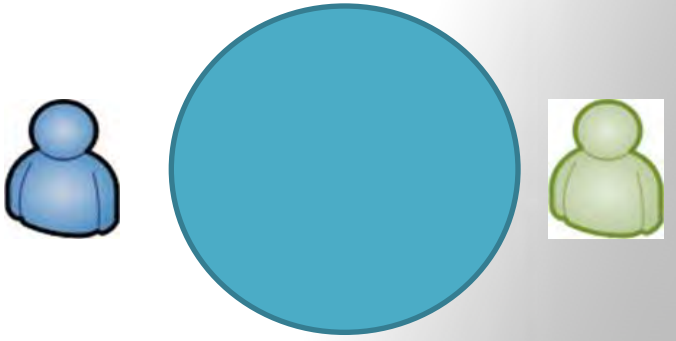
Open Distributed Systems: The ecosystem challenge



AAL Space and user interaction



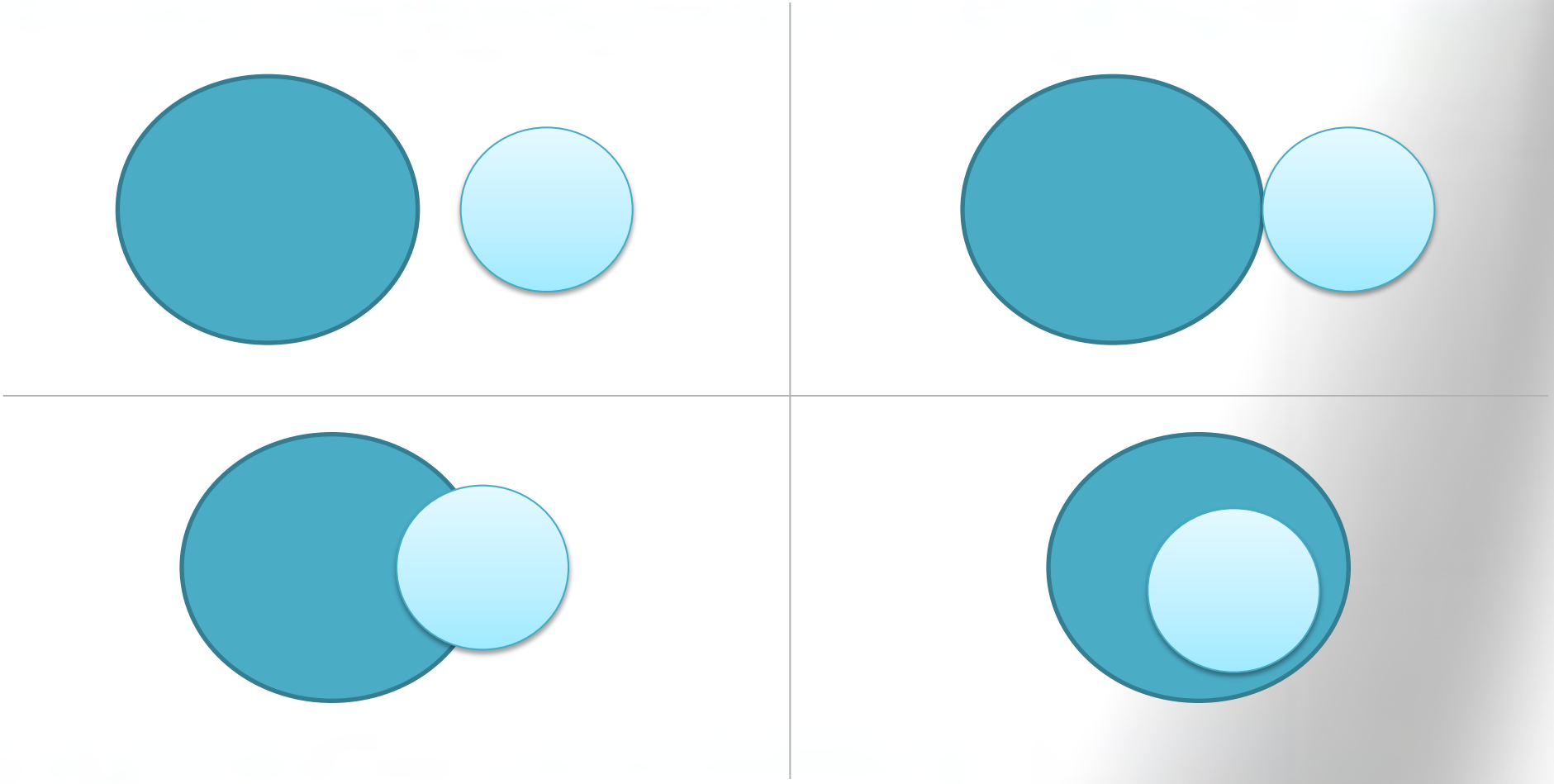




Two AAL Spaces (physically / resource sharing)

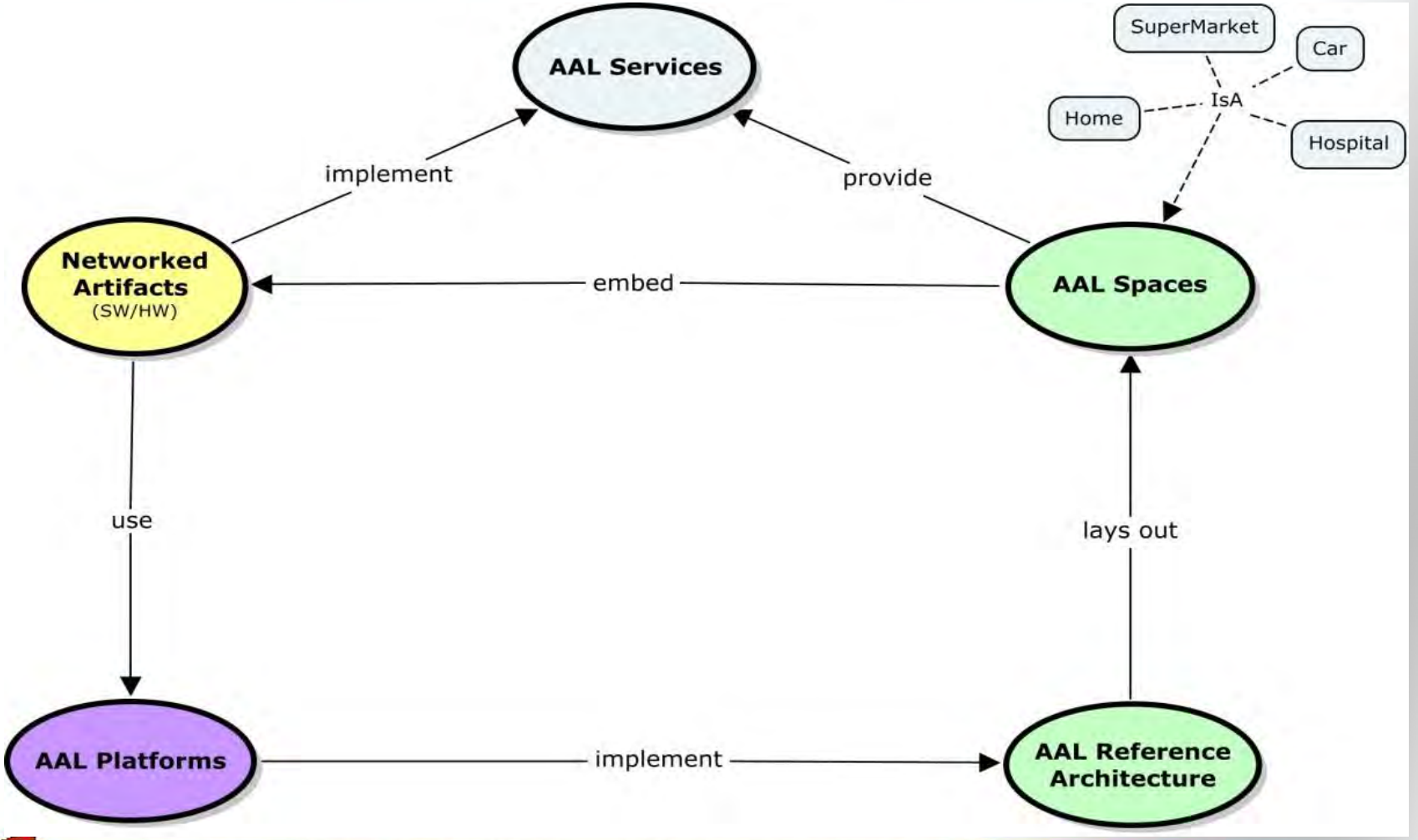
owner

non-
owner

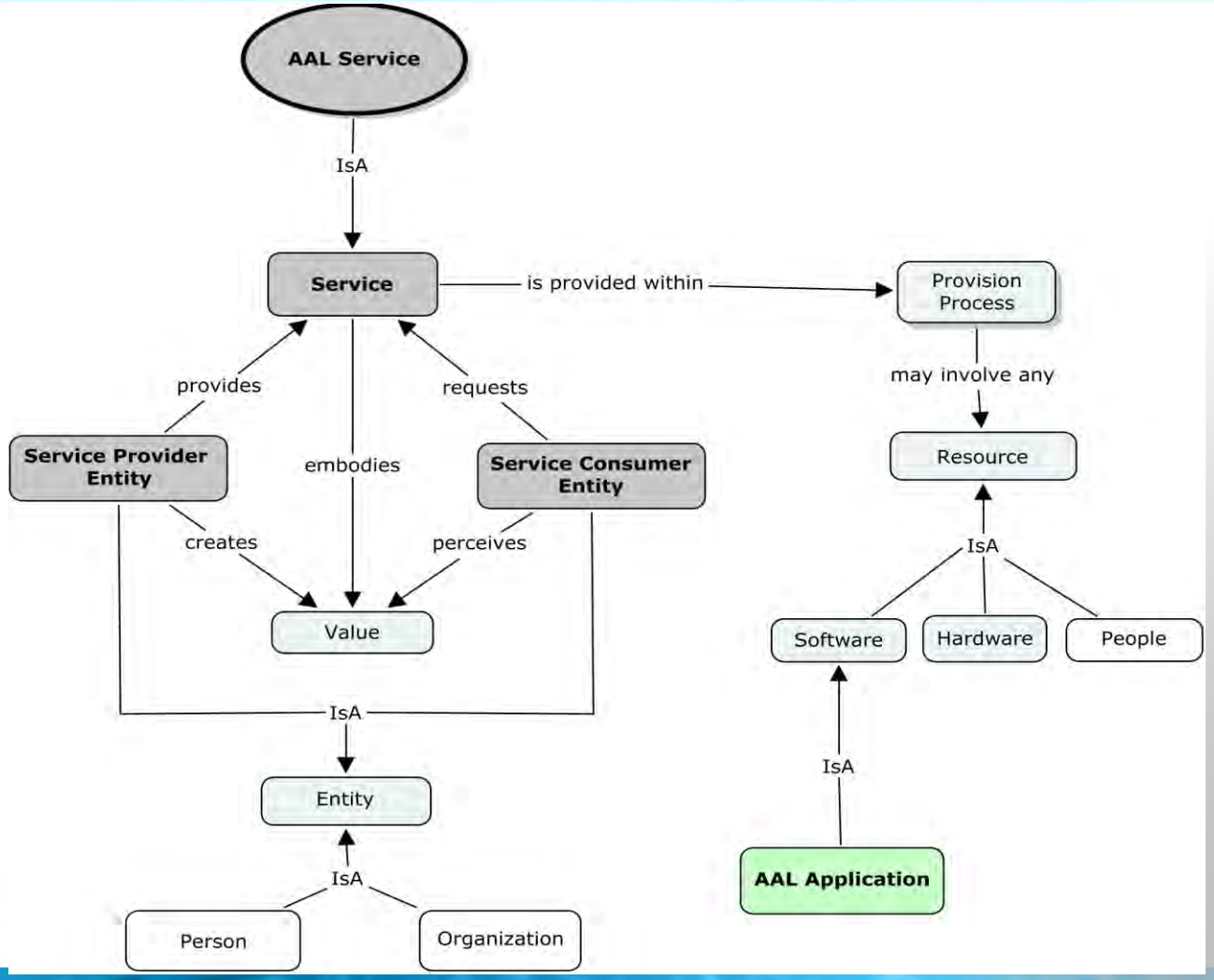


The universAAL Reference Model for AAL

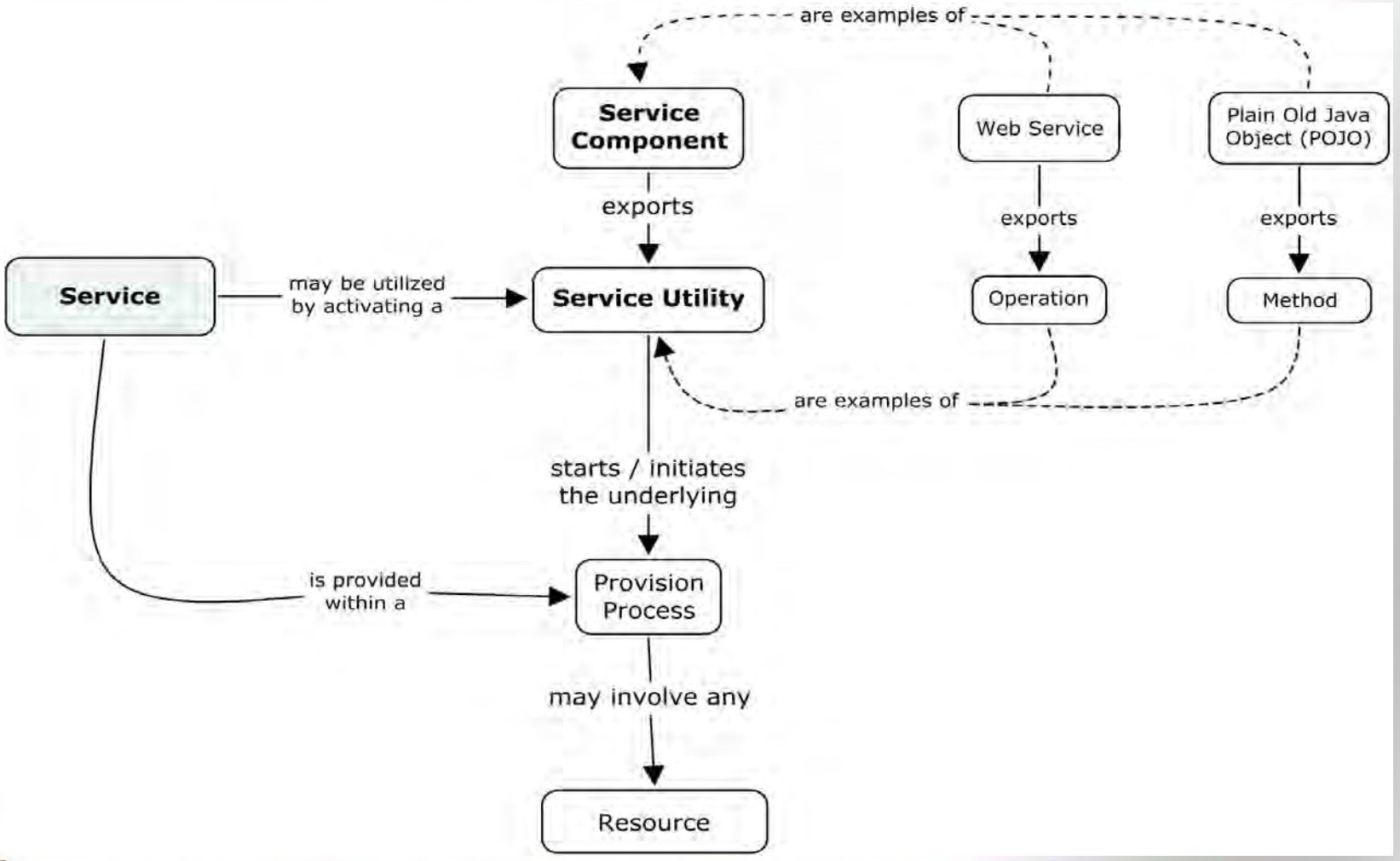
The Root Map: An understanding of AAL Systems



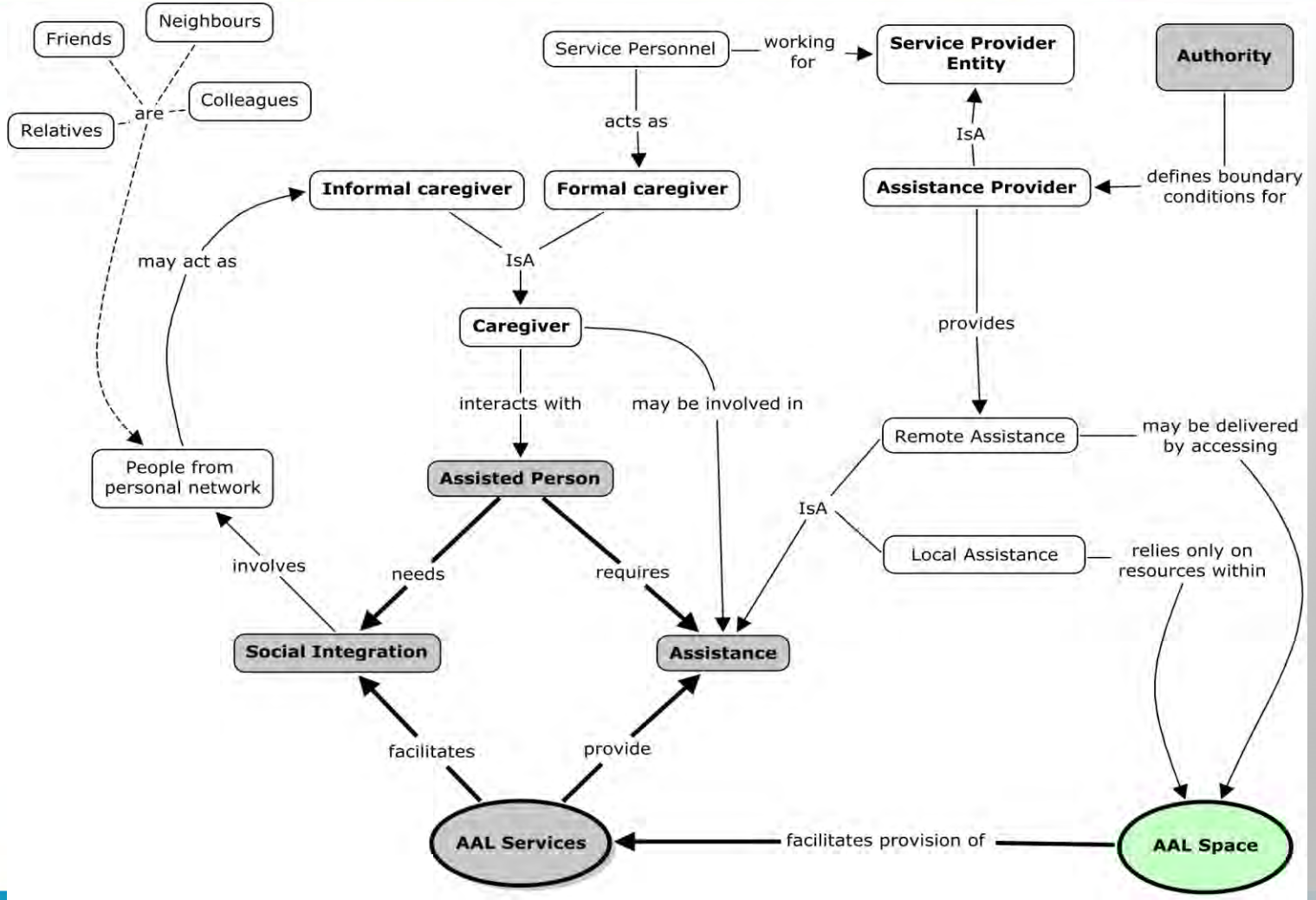
An AAL Service is a Service



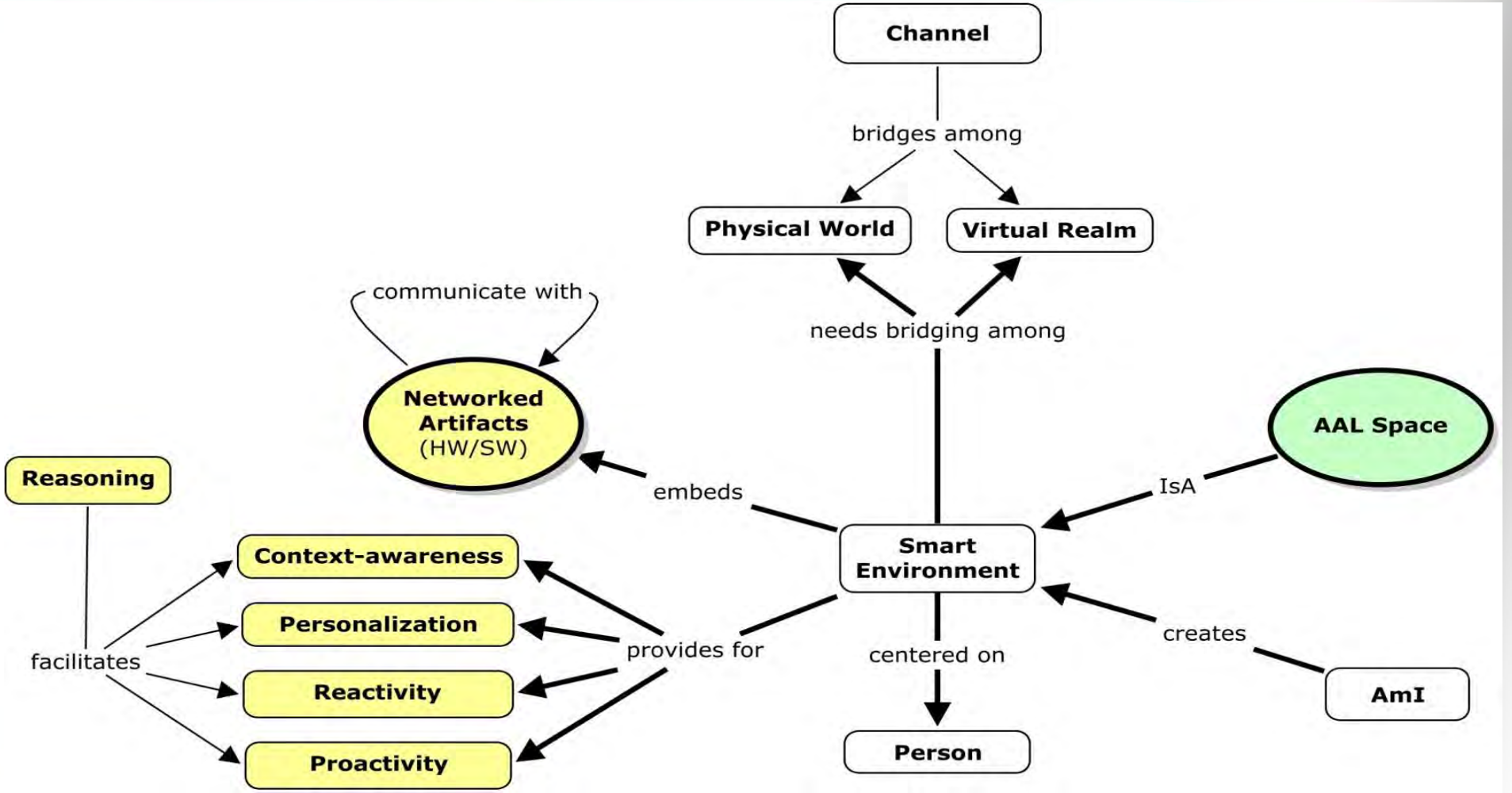
Services in the virtual realm:
An abstraction over outsourced functionality



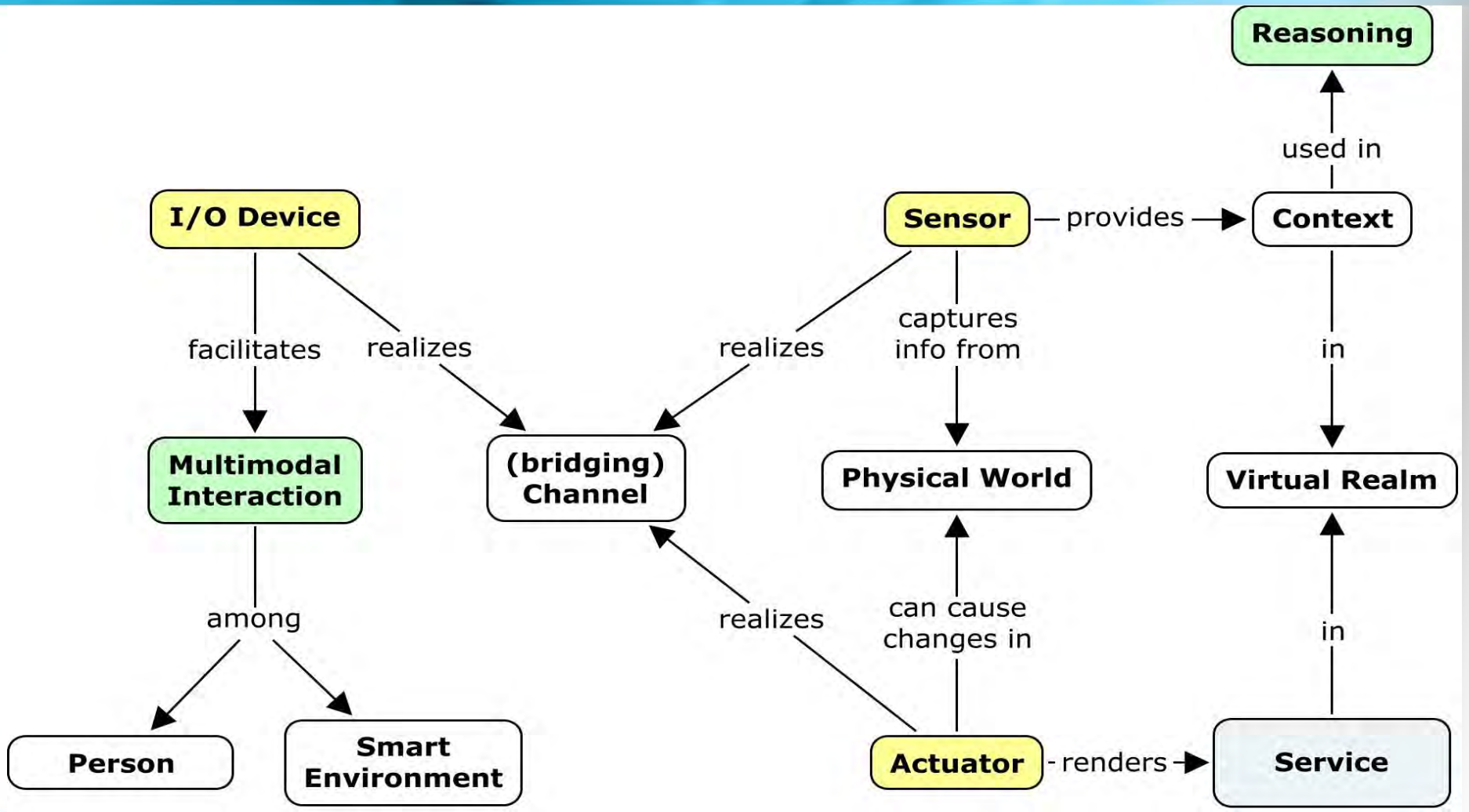
The domain-specific context of AAL Services



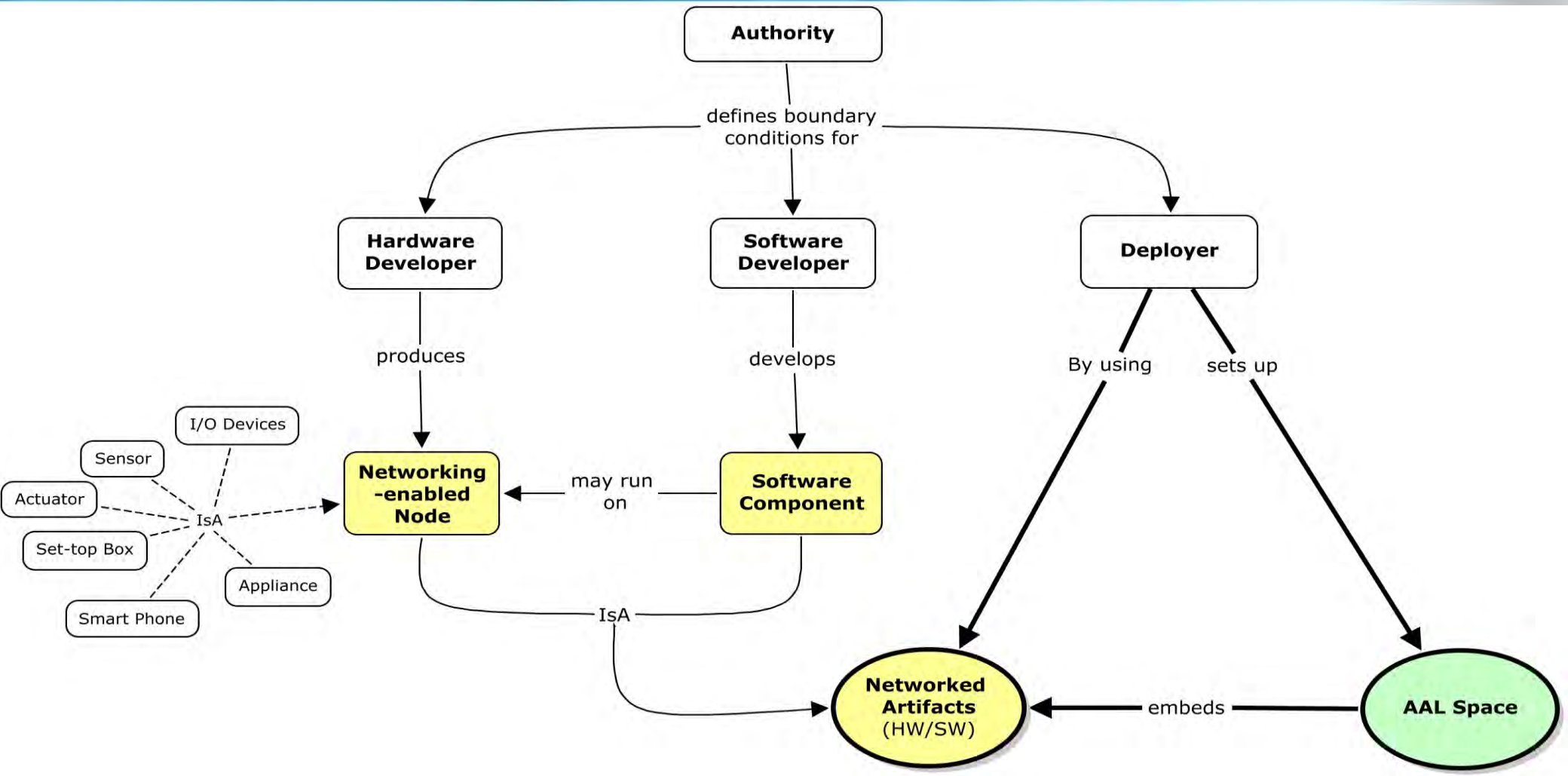
Relationship between AAL Spaces & AmI



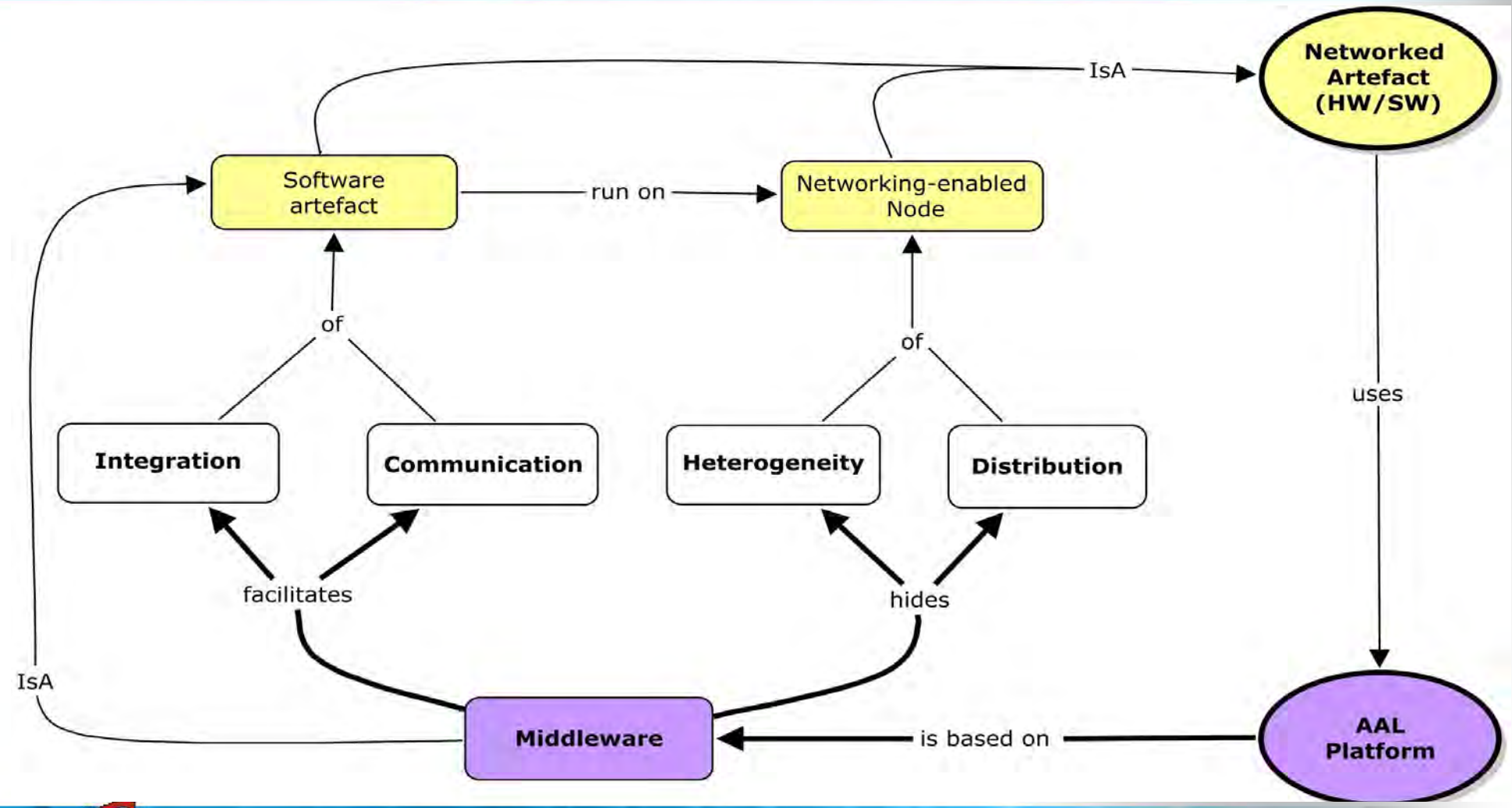
More on “Channel”s



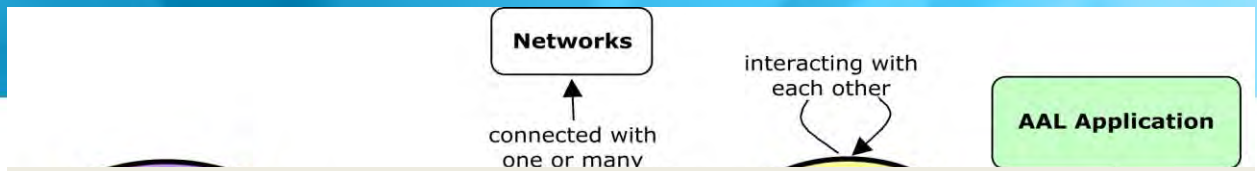
Technical Stakeholders



Middleware


Networked Artefact (HW/SW)
IsA
Software artefact
run on
Networking-enabled Node
of
of
uses
Integration
Communication
Heterogeneity
Distribution
facilitates
hides
IsA
Middleware
is based on
AAL Platform

AAL Application



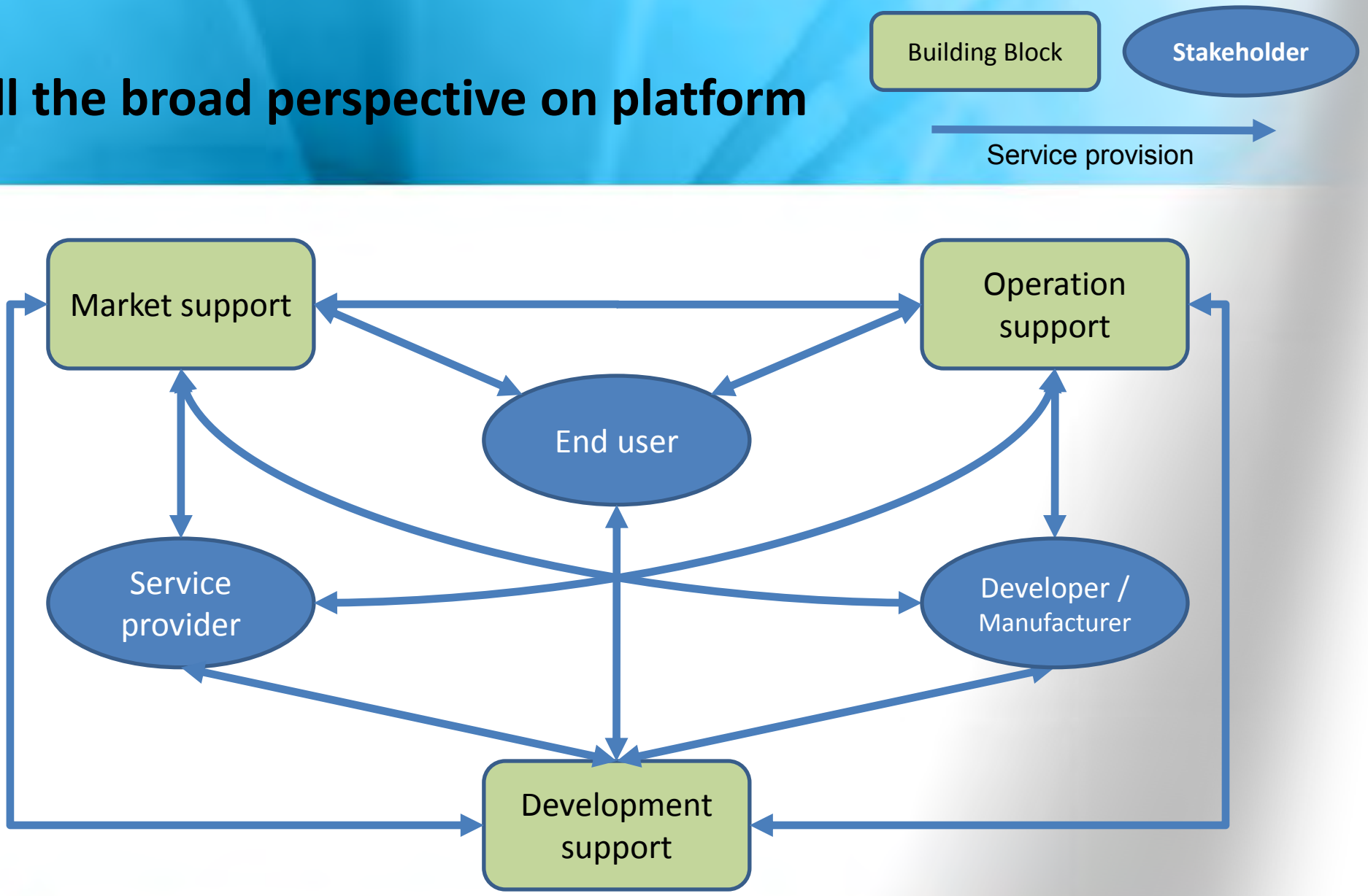
More in: universAAL Deliverable D1.3

Or

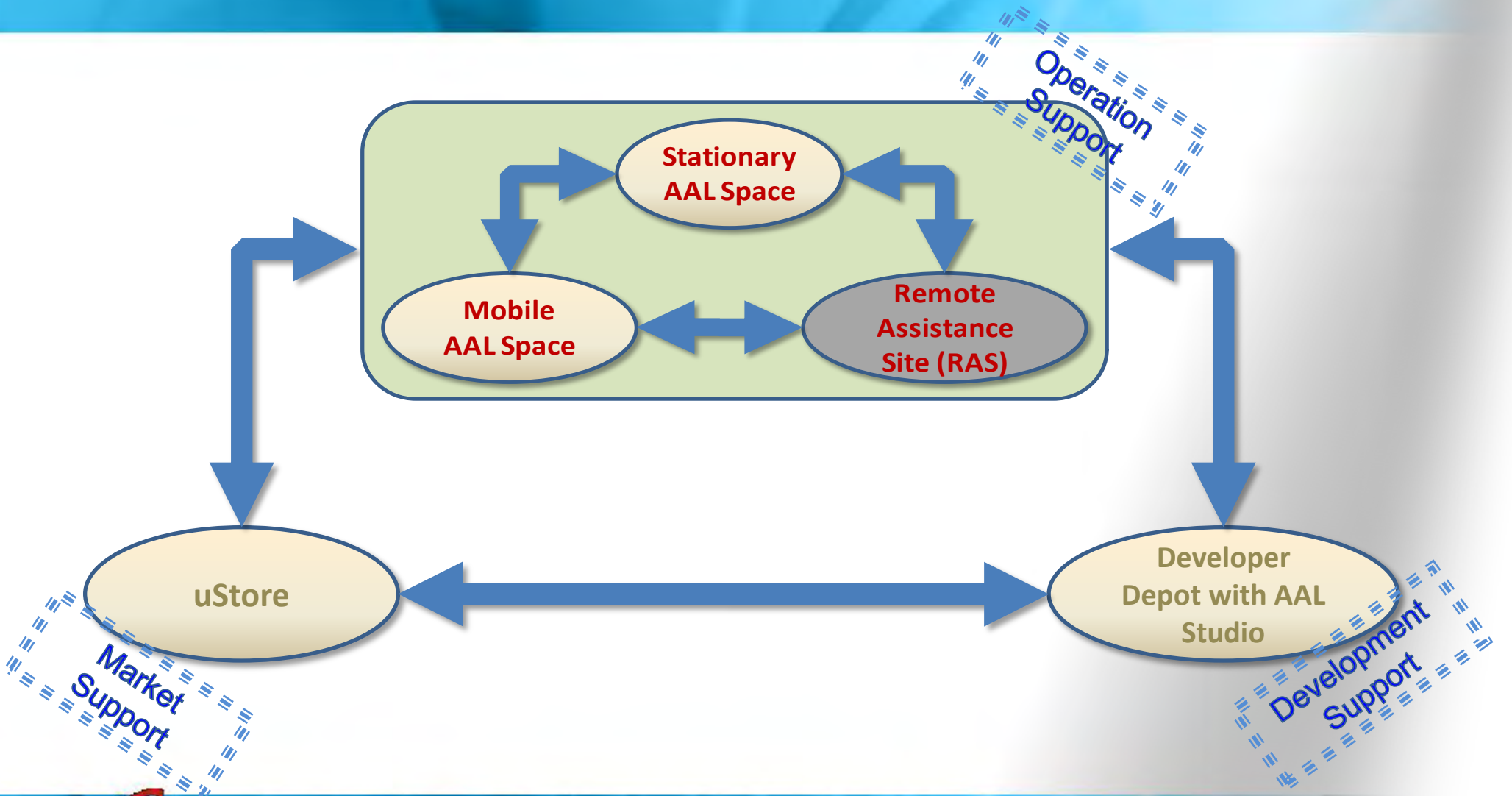
Tazari, Mohammad Reza; Furfari, Francesco; Fides Valero, Álvaro; Hanke, Sten; Höftberger, Oliver; Kehagias, Dionisis; Mosmondor, Miran; Wichert, Reiner; Wolf, Peter: The universAAL Reference Model for AAL. In: Augusto, Carlos (Ed.) u.a.: Handbook of Ambient Assisted Living : Technology for Healthcare, Rehabilitation and Well-being. Amsterdam; Berlin: IOS Press, 2012, pp. 612-625

Thinking in terms of building blocks

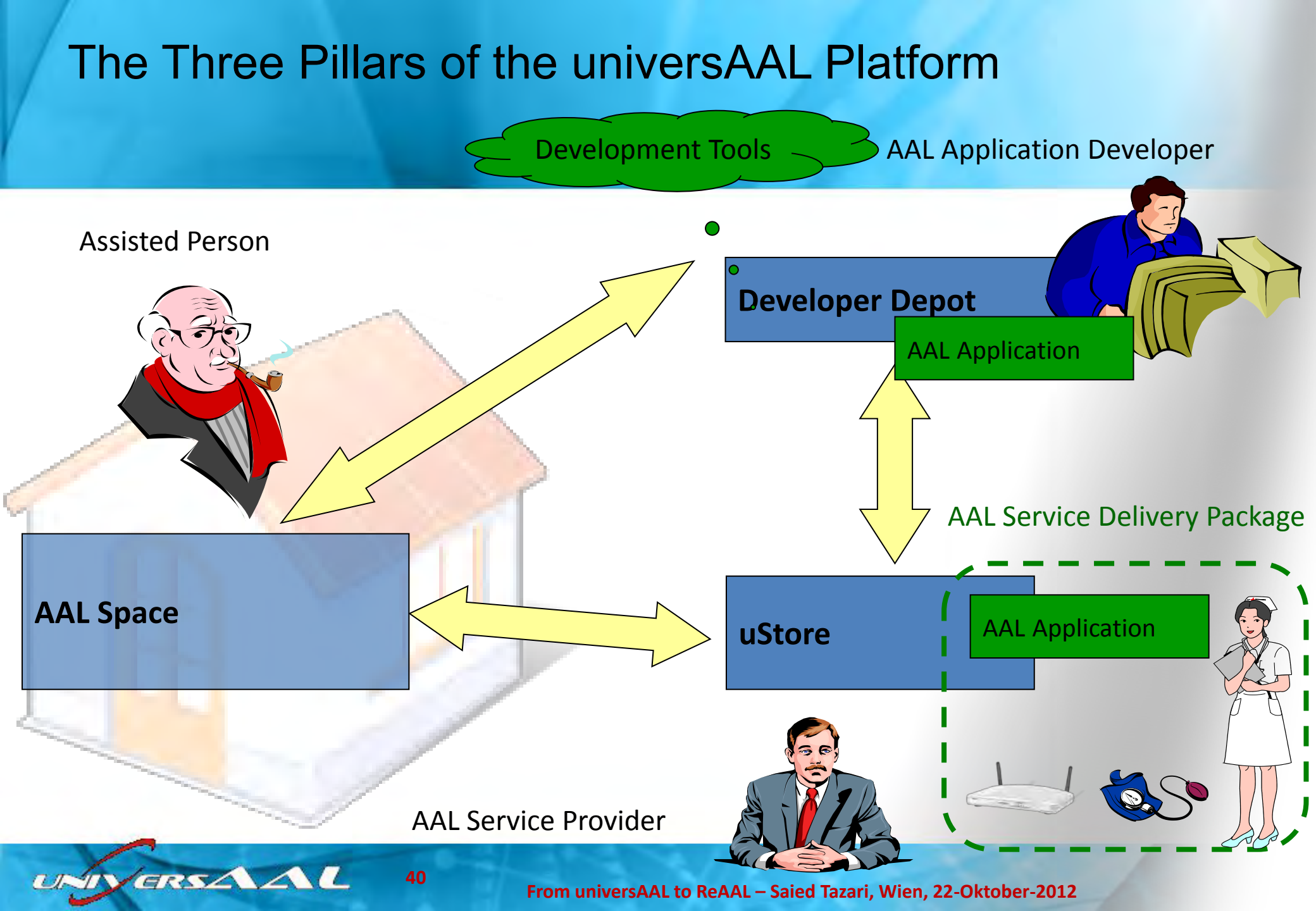
Recall the broad perspective on platform



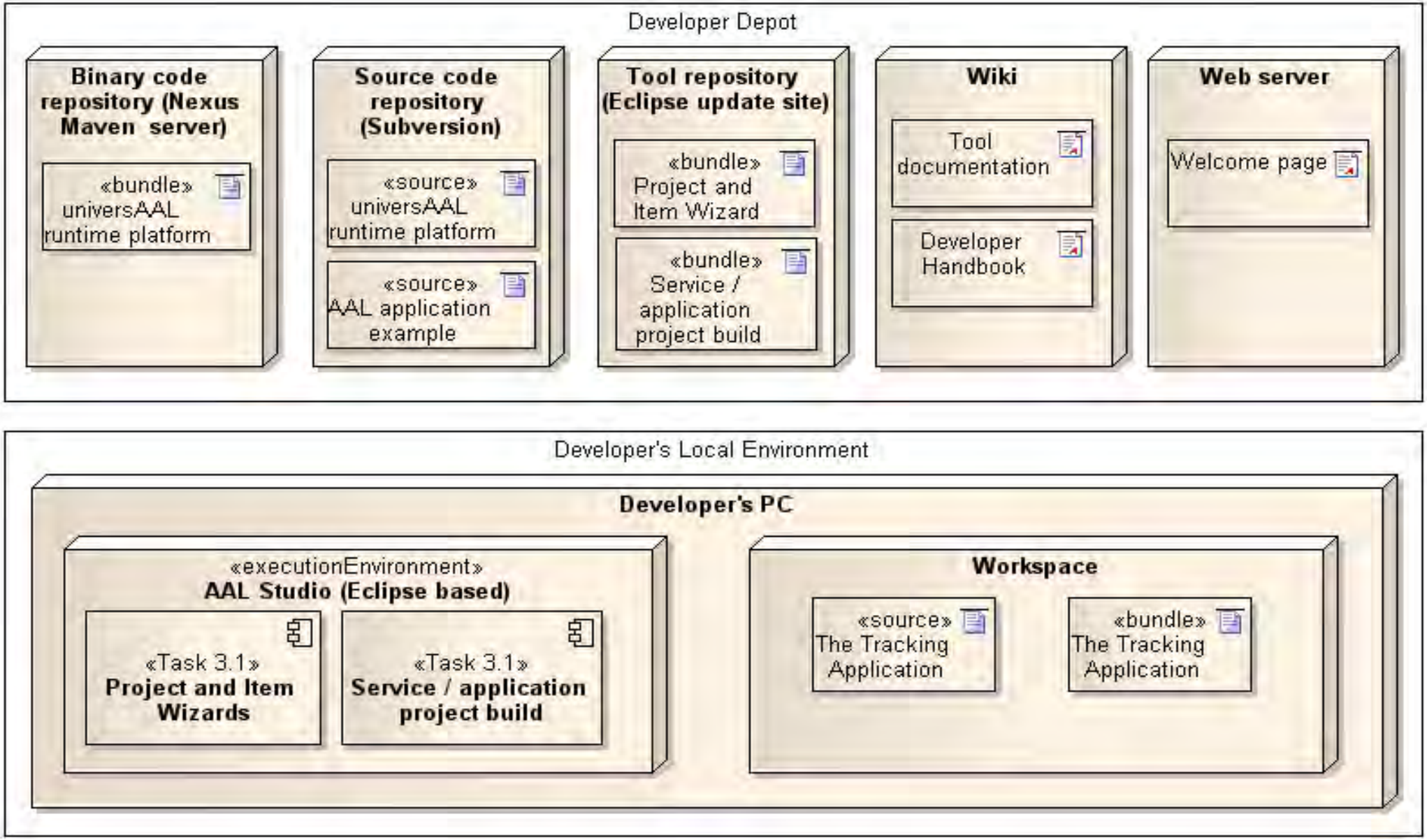
A first Refinement



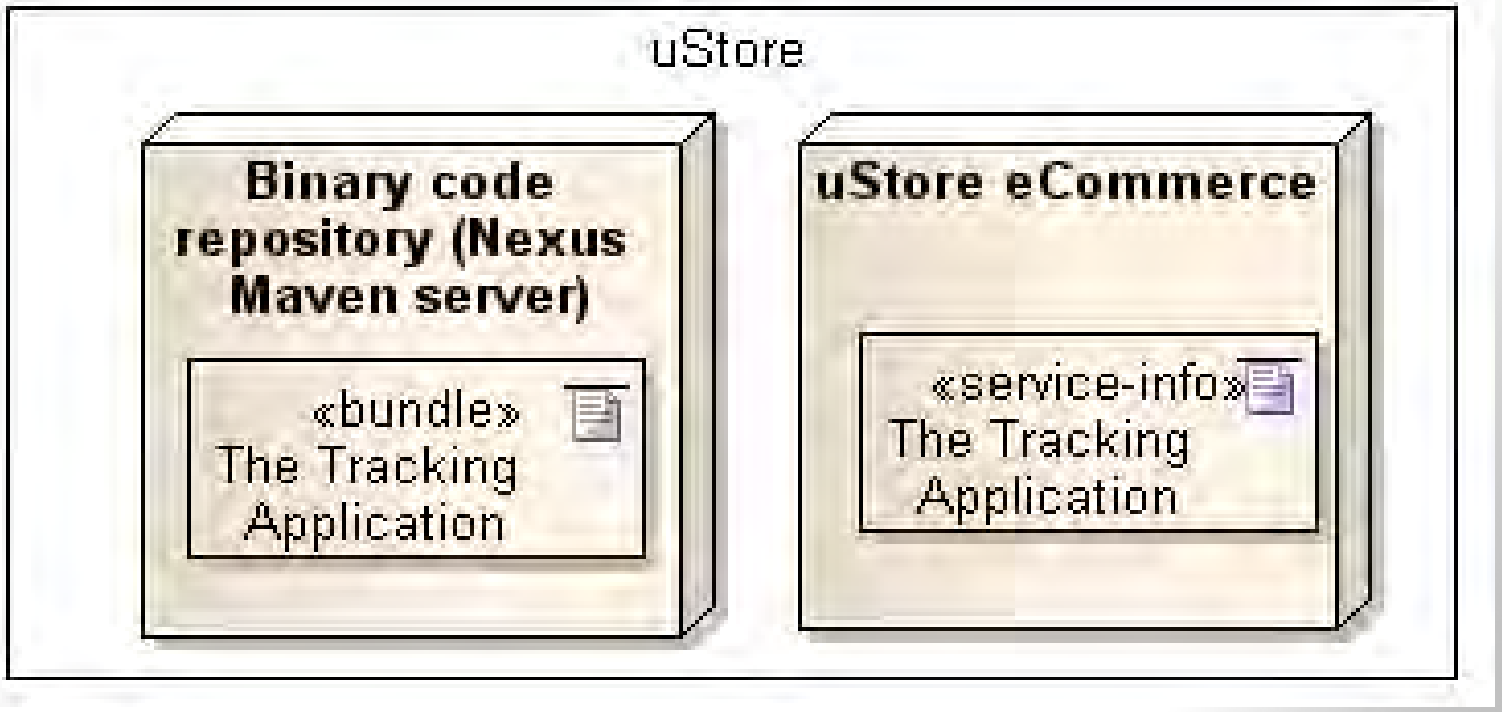
The Three Pillars of the universAAL Platform



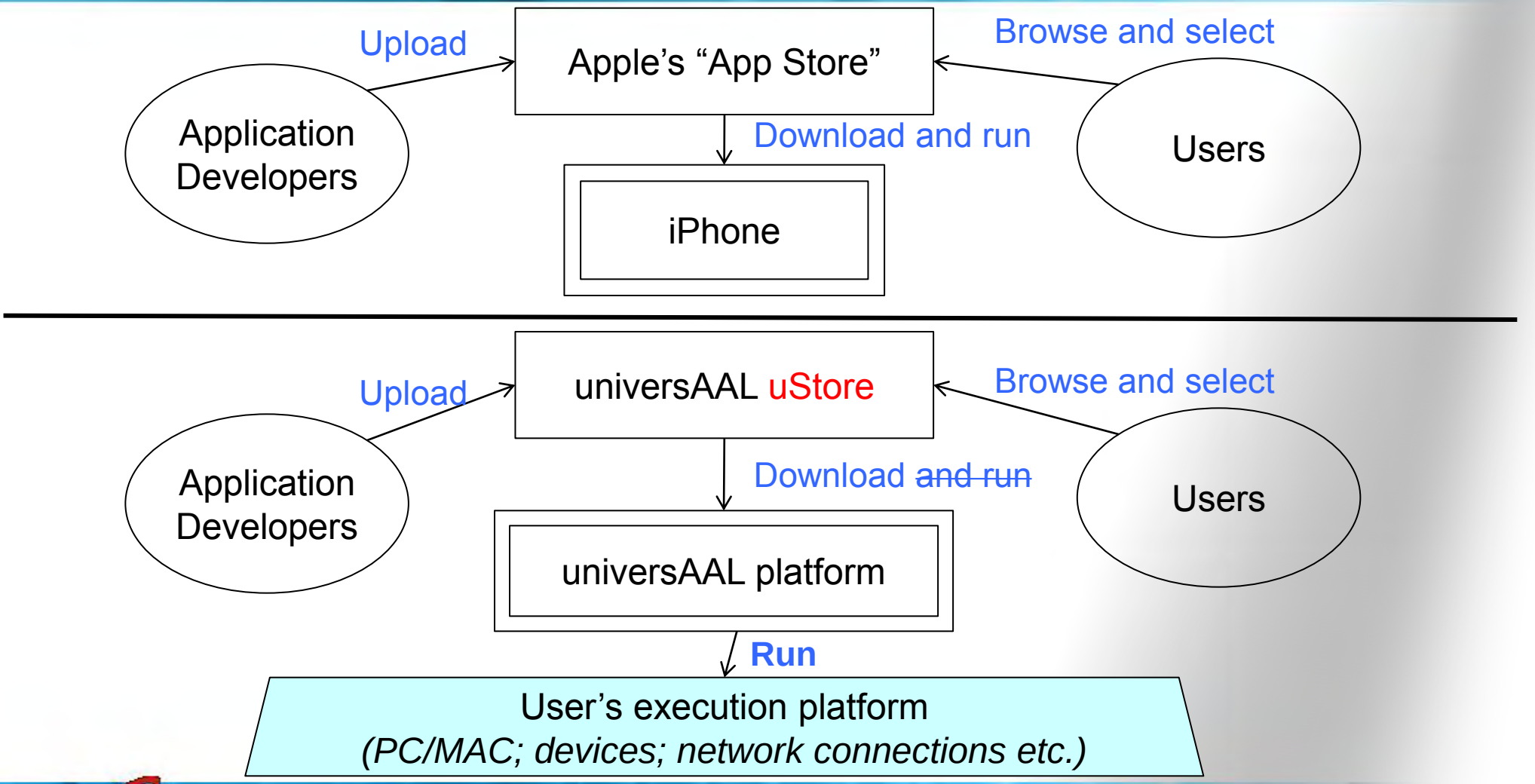
Development Support



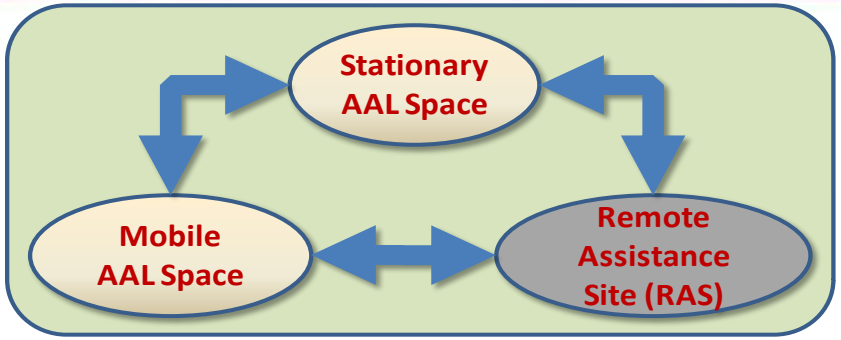
Market Support

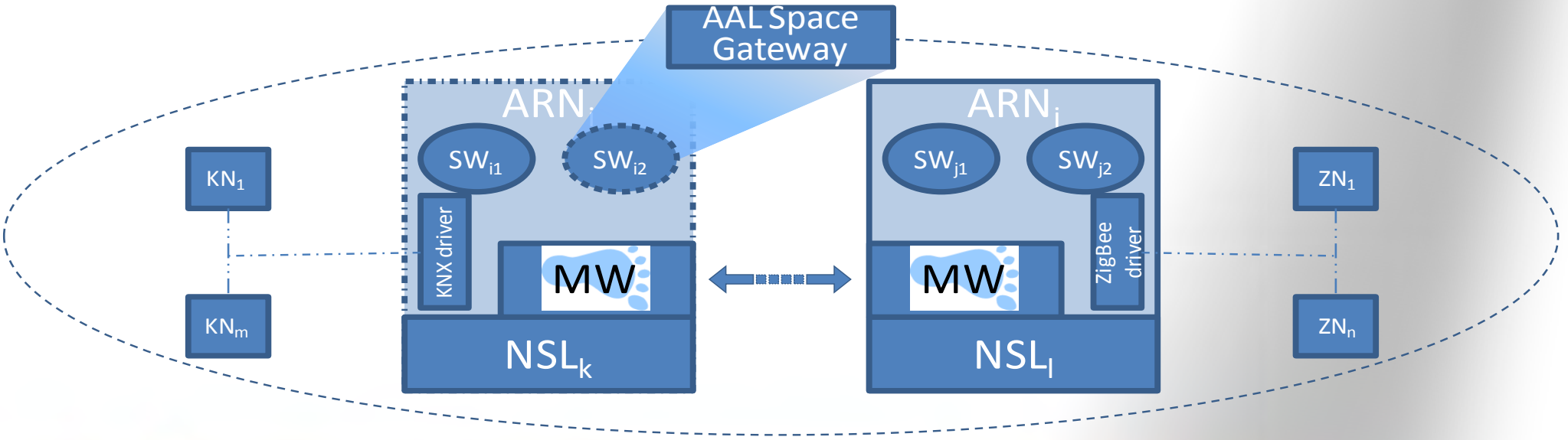


The uStore concept

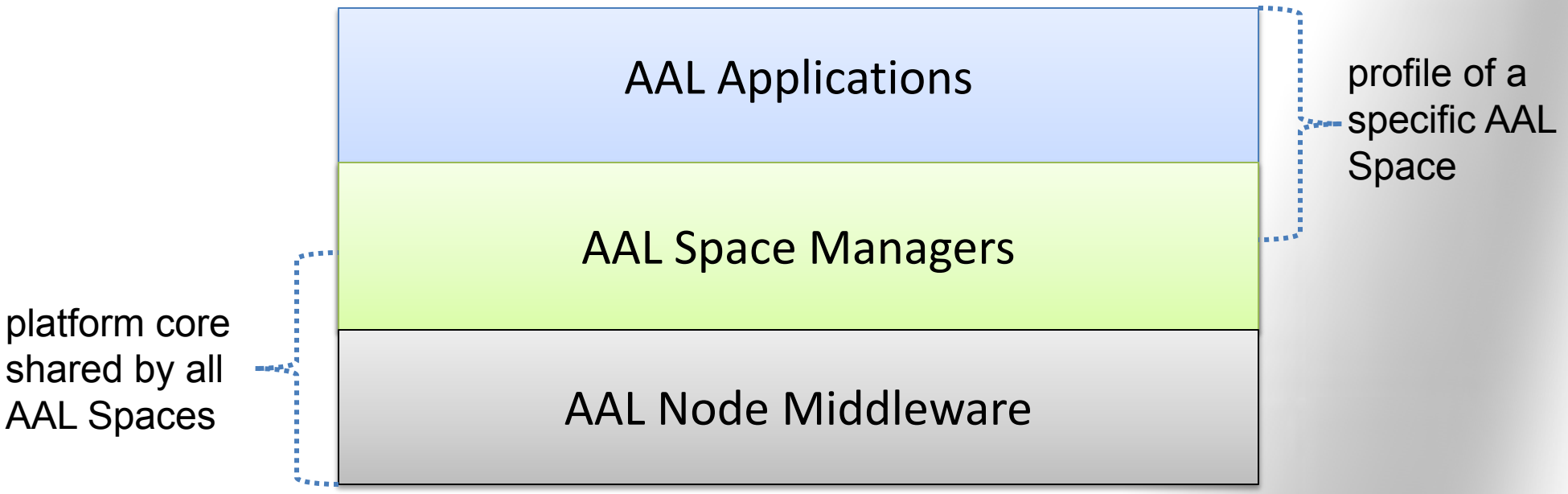


Operation Support in AAL Spaces

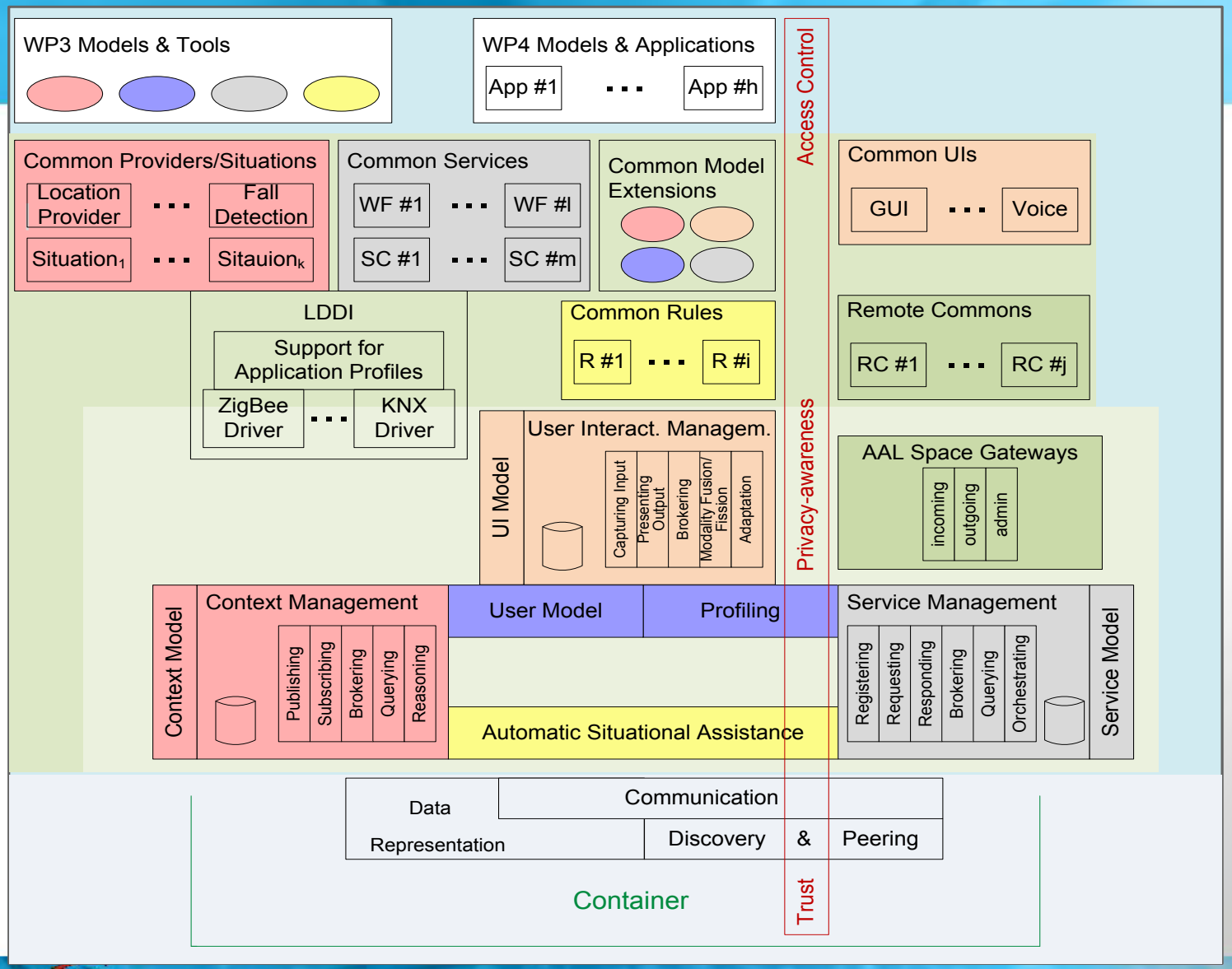




Problem-solving in AAL Spaces



Abstract Building Blocks derived by Generalization



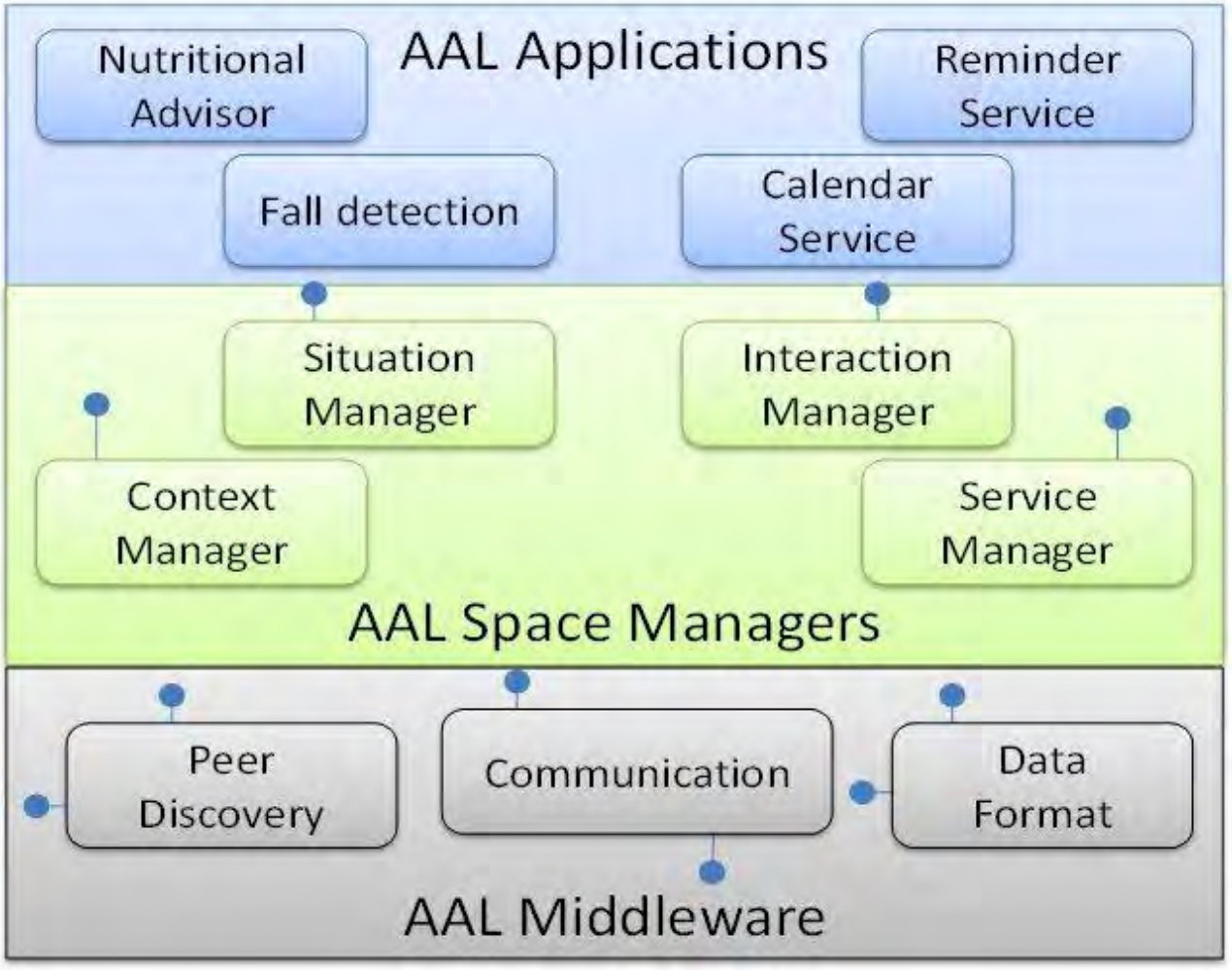
AAL Applications

AAL Space pickable Managers

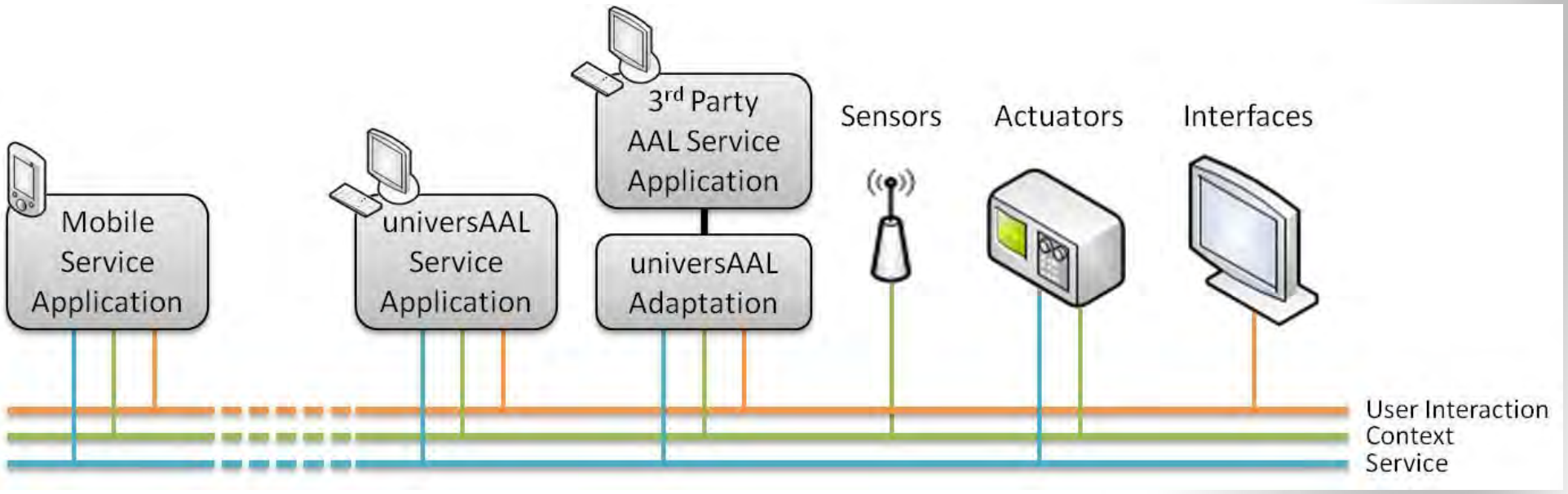
AAL Space mandatory Managers

AAL Node Middleware

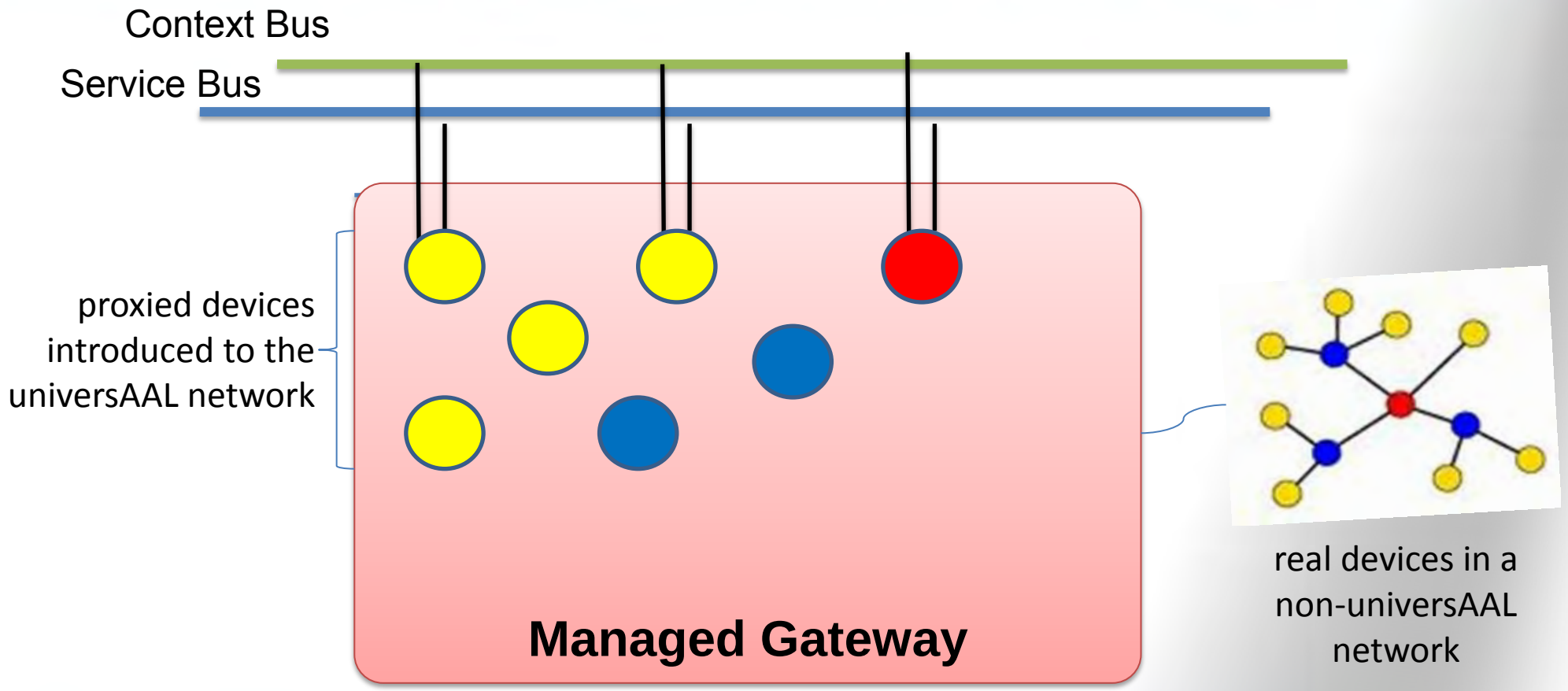
Simplified View



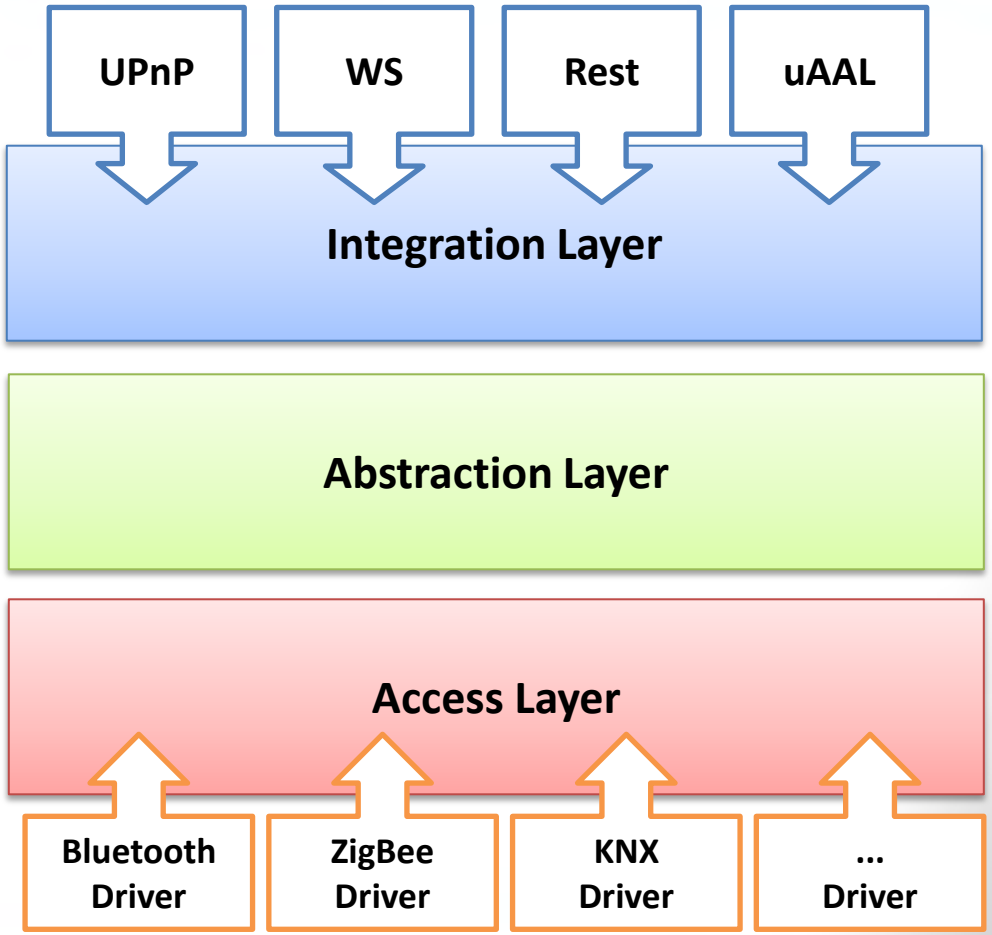
High-level Communication Protocol Supporting Semantic Interoperability

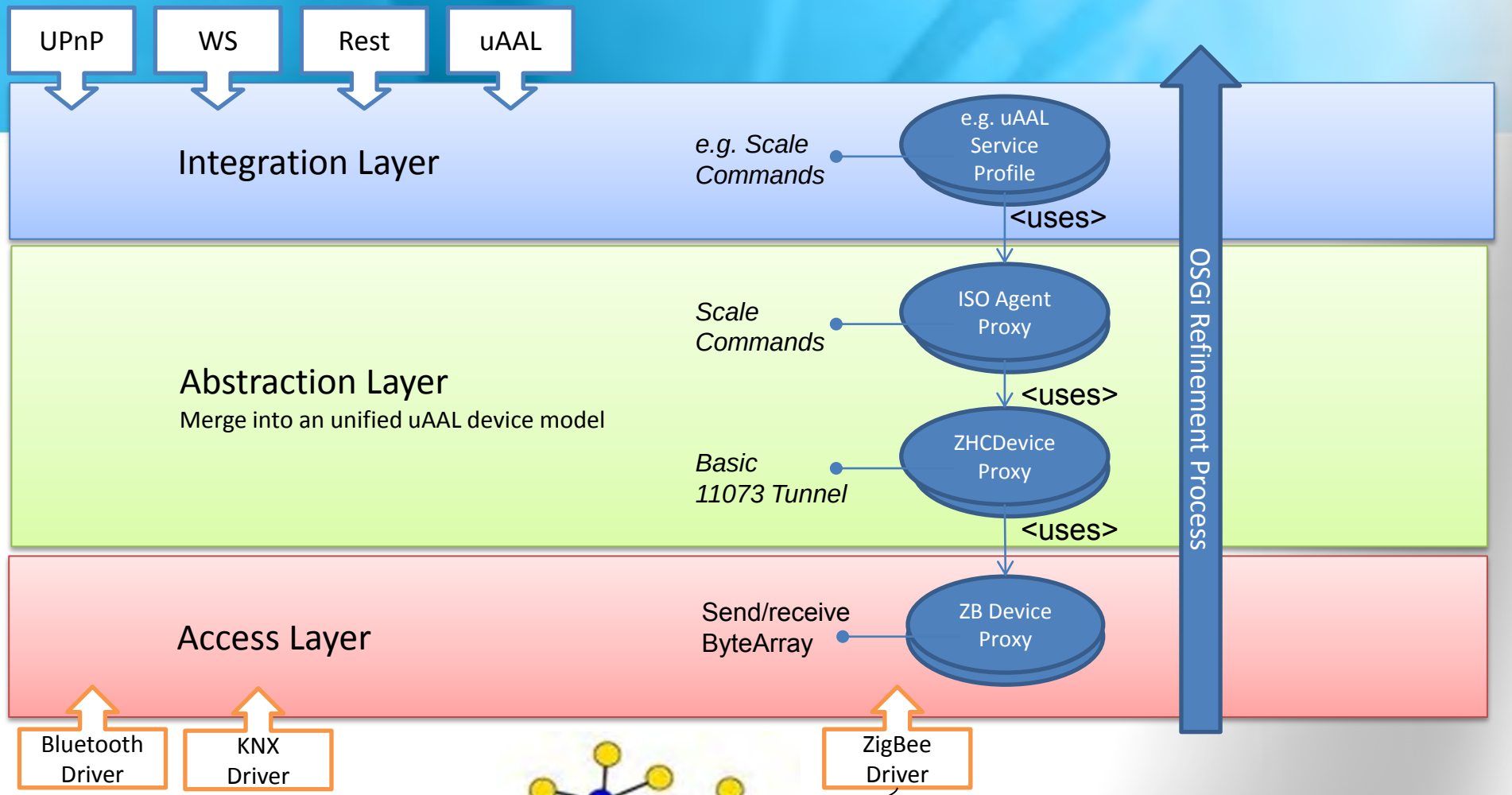


Integration of Special-purpose Devices

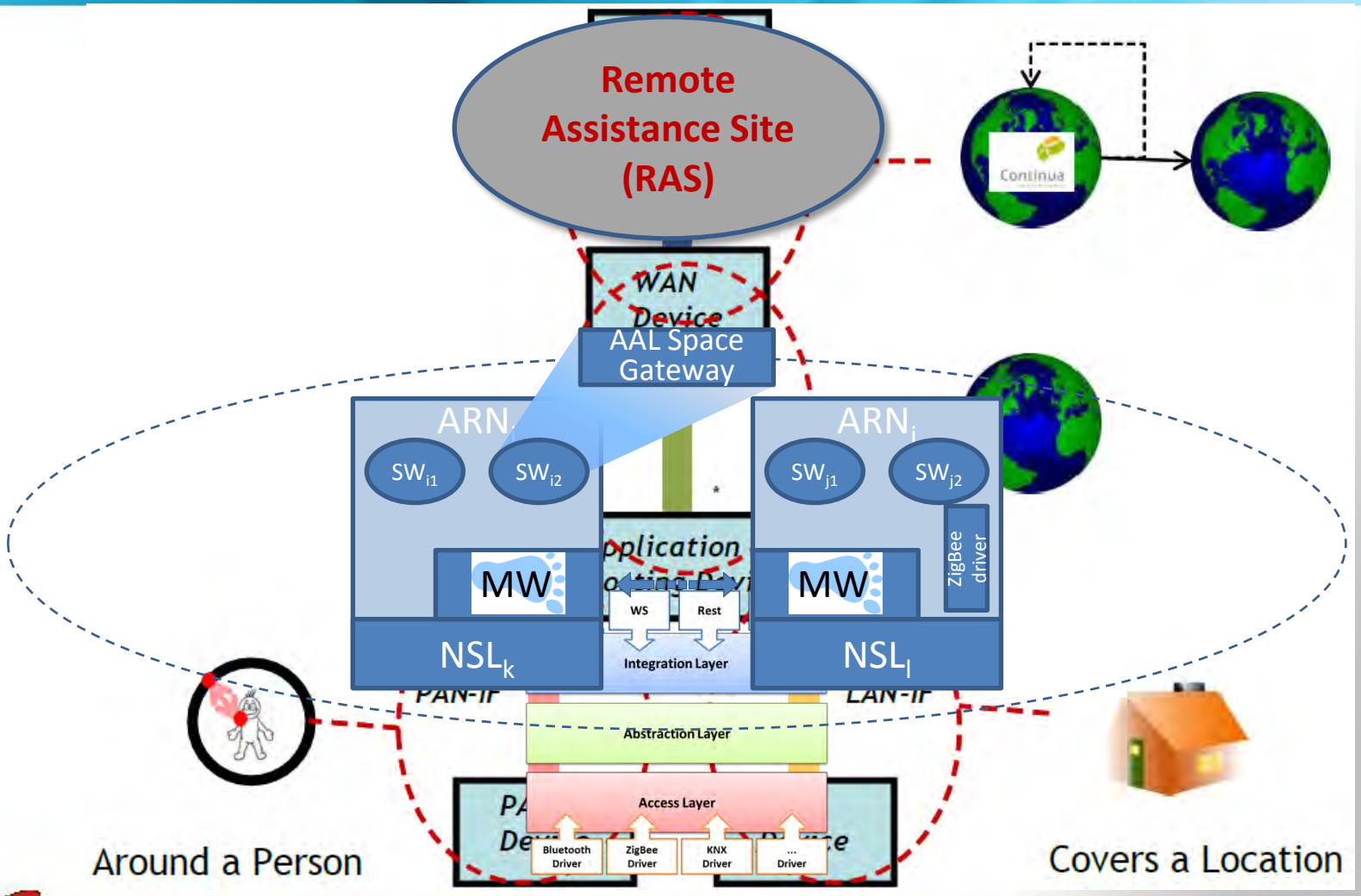


Design Pattern for Local Device Discovery & Integration




UPnP
WS
Rest
uAAL
Integration Layer
e.g. Scale Commands
e.g. uAAL Service Profile
<uses>
Abstraction Layer
Merge into an unified uAAL device model
Scale Commands
ISO Agent Proxy
<uses>
Basic 11073 Tunnel
ZHCDevice Proxy
<uses>
Access Layer
Send/receive ByteArray
ZB Device Proxy
OSGi Refinement Process
Bluetooth Driver
KNX Driver
ZigBee Driver
ZigBee Transport with ISO 11073 Payload
ZigBee Sensors
ISO 11073:10471 Agent – ZigBee Node

Comparison with the Continua Architecture



Current Developments

An Explicit Notion of AAL Spaces

- AAL Spaces are Smart Environments
  - sensor and devices distributed in the environment to assist the person
- AAL Spaces are standardised
  - Different profiles for Near-body, Home, Car, Office, ...
- AAL Spaces are infrastructured environments
  - In most of them exist stationary nodes
- AAL Spaces are dynamic environments
  - Mobile nodes join and leave continuously
- AAL Spaces are ***managed*** environments
  - Authorised entities may remotely check the devices deployed in the space for assistance or system maintenance
- AAL Spaces have a ***life-cycle***
  - They are created, configured, updated, managed and destroyed
  - Continuously working
- AAL Spaces may be connected and ***federated***
  - Context information can be shared among connected spaces
- AAL Spaces ***evolve*** over time
  - The software framework of the middleware may change (i.e. number of brokers, the broker strategy, ...)

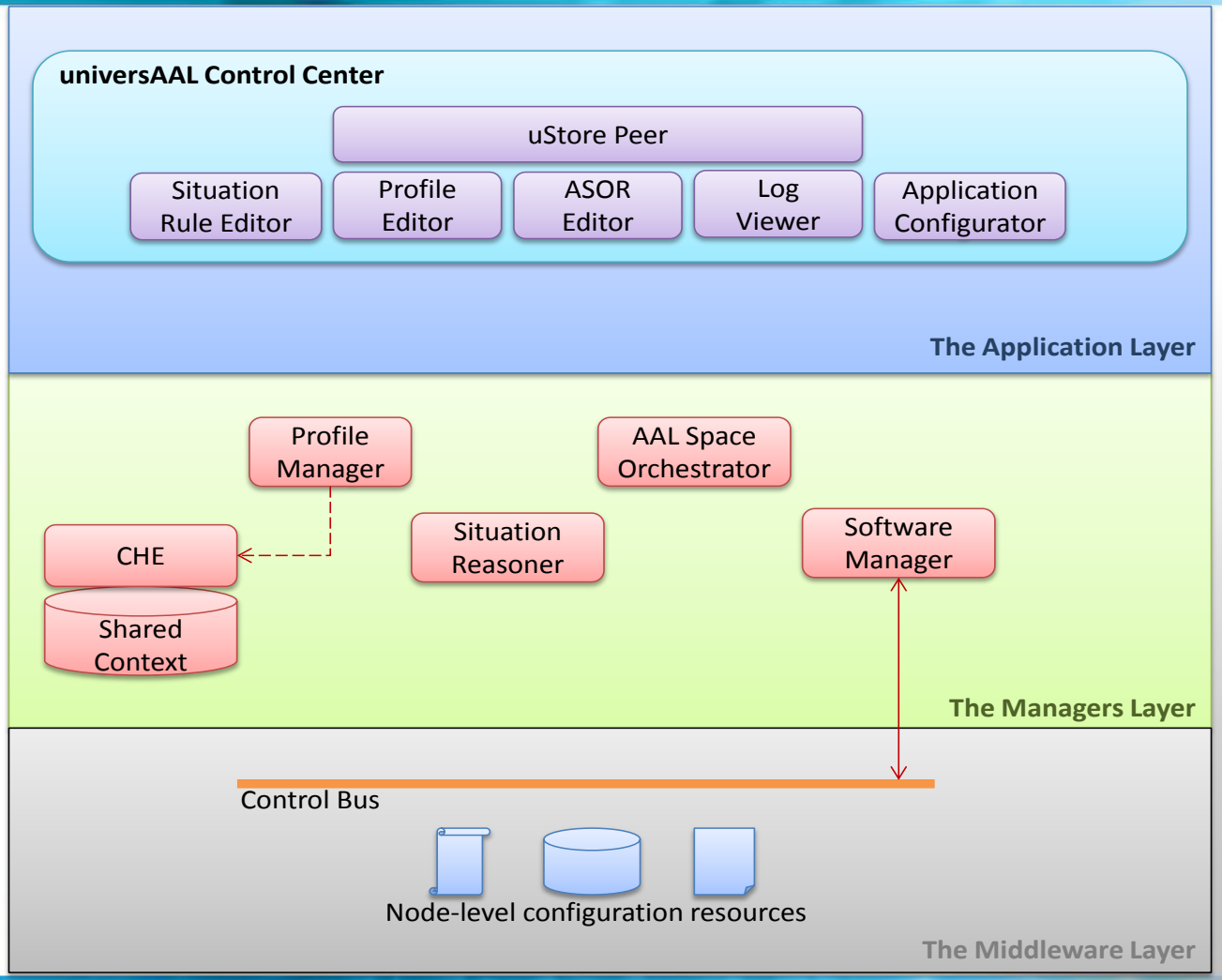
AAL Space Profiles
(Near-body, Home, Car, Office, ...)

- Profile standardization to deal with:
  - **Industrial production of devices/services** implementing specific features of the AAL Spaces
    - Context awareness server, Localization subsystem, service provisioning, healthcare devices, ...
  - Define the ontologies that such devices/services must be aware of when working in specific spaces
  - Support for AAL Application developers: know what is installed (mandatory) and what might be available in such spaces
  - For industry -- Identify precise markets and product opportunities
  - For developers -- Simplify the development target
  - For installers -- clarify what should be installed, how and where
  - For users -- Defines a clear user experience

Configurability & Remote Management

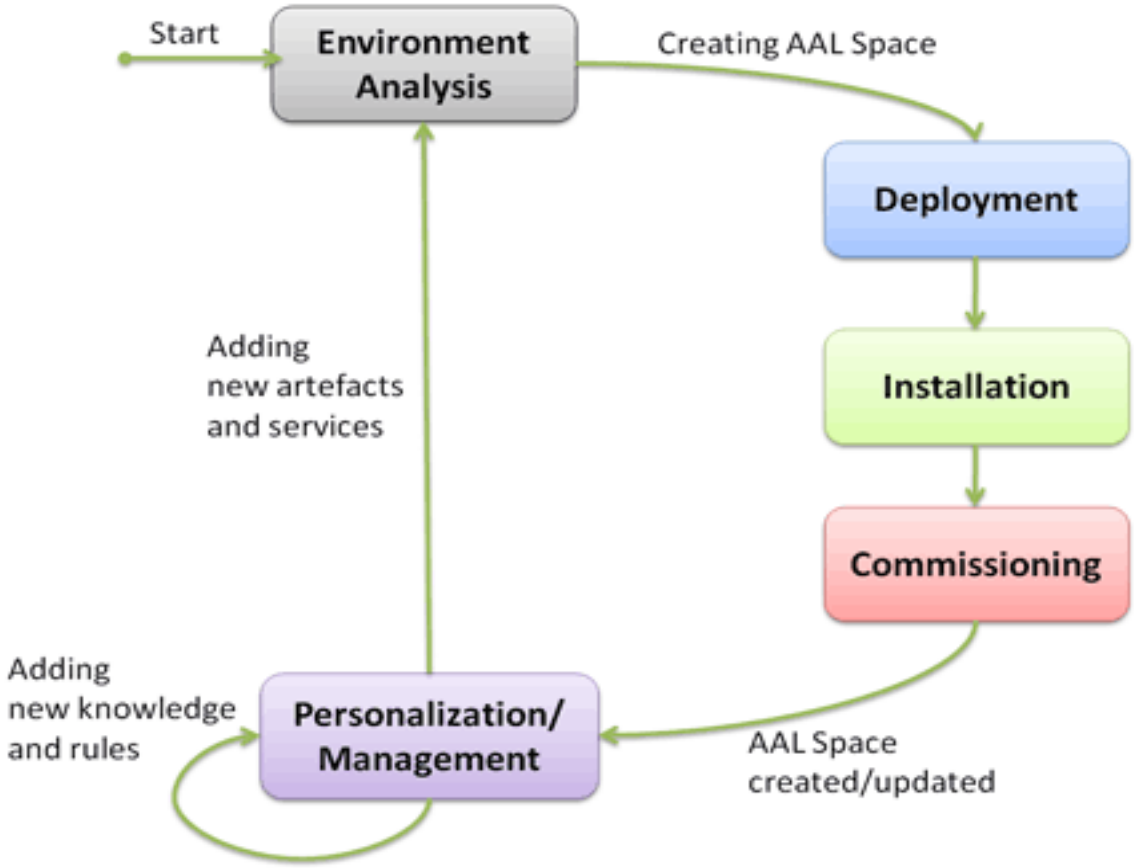
- Remote management of the devices belonging to the AAL Space is a sort of remote assistance
- Scenario involving Controlled Flats is a business case requiring such facility
- OSGi platform offers some facilities for a single runtime instance, we need to face the problem for distributed resources of the Home Networks
  - Locate, check and update software in different hosts
  - Scalability – management of many remote Home Space
- Real case scenarios have NAT routers hiding the resources in the Home Network(s) -- Get ready for IPv6 !

Configurability & Remote Management



AAL Space Life-Cycle

- **Face all the previous challenges with a unifying process** that explains to *Developers*, *Installers* and *End-users* how AAL Space are created, managed and destroyed, and which tools are uses in the various life cycles.
- API to manage the different Life-cycle aspects
  - The Control bus



Resources

- www.universaal.org, esp.
  - all deliverables immediately after release
  - Newsletters, publicity material, comic
- depot.universaal.org, the entry point for developers (reachable also through the home page)
  - Getting started developing AAL applications
  - Learning more about the platform & contributing to the development of the platform
- forge.universaal.org (reachable also through the Developer Depot) with
  - source codes, Javadocs, & Wiki Pages
  - forum discussions

THANK YOU FOR PAYING ATTENTION!

Questions?

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