

Thread Technology Workshop

Fairhair: Facilitating the Internet of Things (IoT) for commercial buildings

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Commercial buildings



Commercial buildings: status quo

Energy

Smart meters,
Demand response



Lighting

Occupancy
sensing



Fire

Detection,
functionality checks



24/7 monitoring

Condition monitoring,
parking lot utilization



Water

Flow sensing,
metering



HVAC

Fans, variable air volume,
air quality



Elevators

Maintenance, performance,
fault detection



Access and security

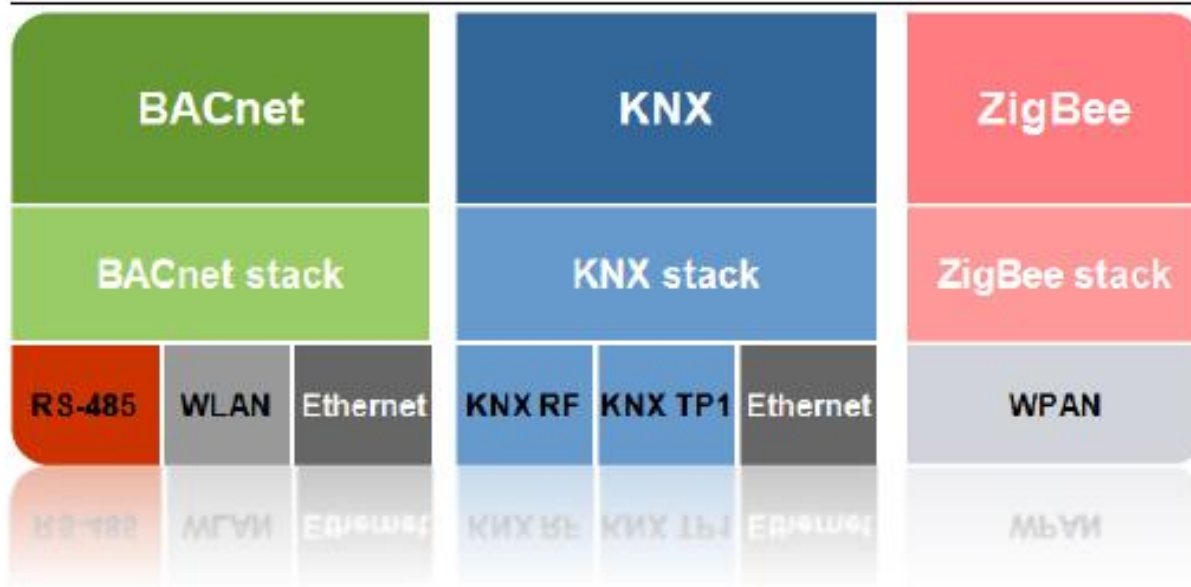
Badge in, cameras, door locks

Building technologies traditionally operate in **isolation** from each other,
with **eco-system specific solutions**.

Multi Data Model & Service Approach

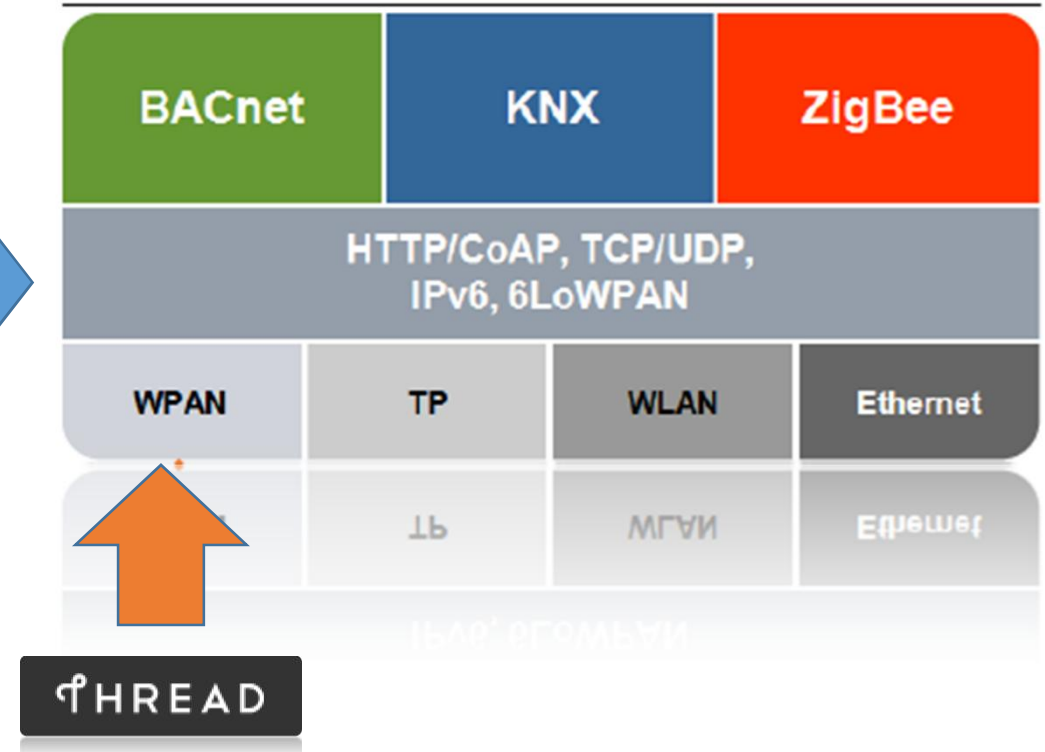
Today (As Is)

Independent stacks



Future (As Desired)

Converged stack



Fairhair Alliance is...

...an alliance of leading companies and organizations from the lighting, building automation, semiconductor and IT industries that aims to **facilitate the Internet of Things (IoT) for commercial buildings.**

Vision

- q Fairhair envisions a future where the Building Automation and Lighting Control industries **share** IoT technologies to build **cost-effective, scalable, and secure system solutions.**

...not another communication protocol!

Fairhair sponsor members



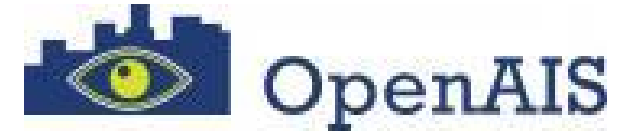
Fairhair regular members



zumtobel group

Fairhair Liaisons

The Alliance has liaison agreements with relevant organizations – such as BACnet, CABA, KNX, OpenAIS, Thread and Zigbee – to facilitate cooperation.



zigbee alliance

Fairhair: technology building blocks

Technology stack & main building blocks

Manufacturer-specific applications



IETF standard building blocks

IPV6

MAC
PHY

Manufacturers can focus on differentiating features

Ecosystems maintain their core assets: application models, tooling, branding

Defines common system services independent on the application specific model:

- Resource model
- Security architecture (enterprise-level)
- Network management
- Resource Discovery
- Event Notification
- Group communication

Target: constrained devices like sensors, dimmers etc..

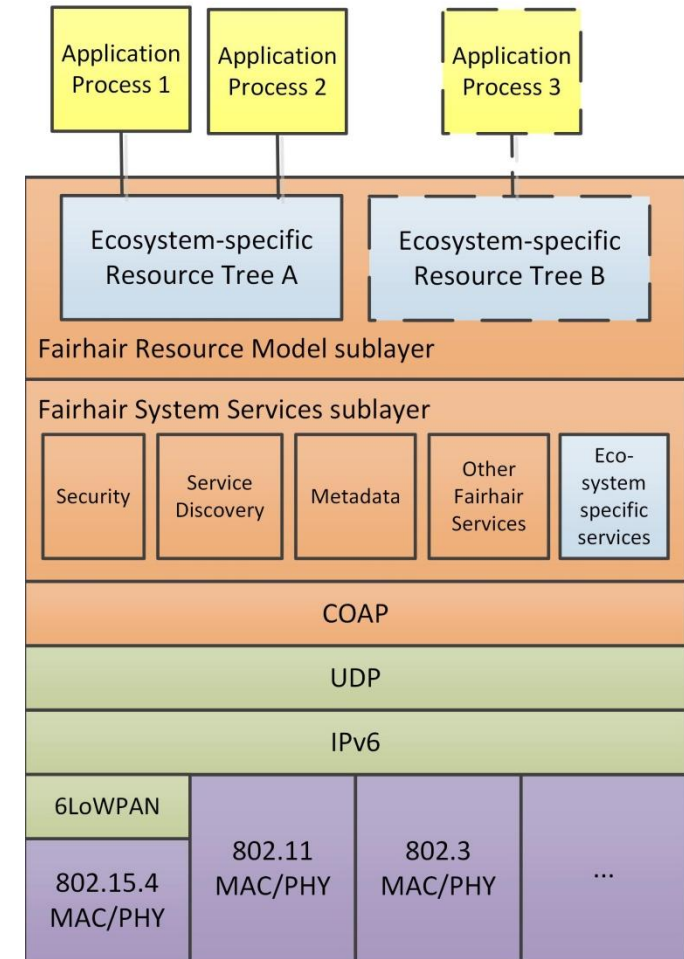
Reuse of standardized IT technologies and established tooling

Wired and wireless communication interfaces

Fairhair System Services: Resource Model

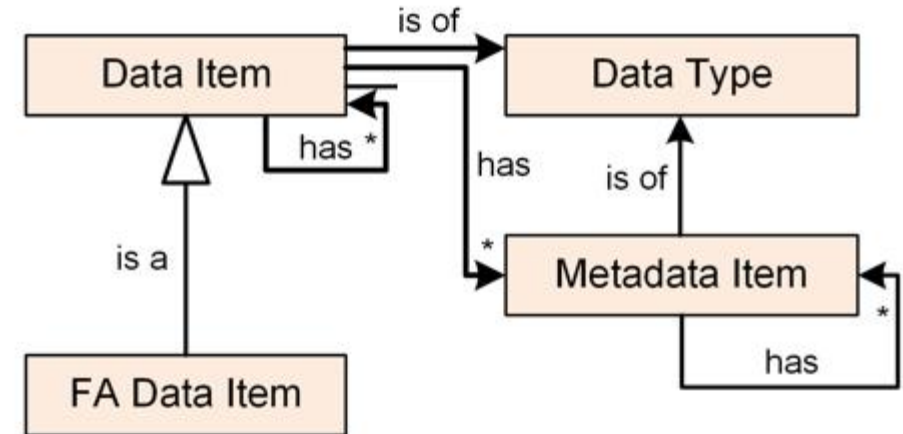
Why Fairhair needs a resource model?

- q It defines the basic building blocks on which semantic understanding, resource discovery, group addressing, event notification and fine-grained access control are built
- q It leverages the **commonalities** across the ecosystems to **enhance interoperability** and to allow the usage of common services
- q Last but not least, it allows to identify aspects that can't be addressed by a generic model and need to be specified in the ecosystem specifications.



The Fairhair resource model

- q follows a RESTful principle
- q defines
 - q basic data types
 - q annotation of data: metadata
 - q access to data and metadata
 - q representation of data and metadata



Metadata: self describing systems

- q Many connected sensors & devices
- q Different manufacturers
- q Different communication protocols
- q Different contexts and cross-applications information
- q Metadata provides semantics, thereby easing integration and enables value creation.

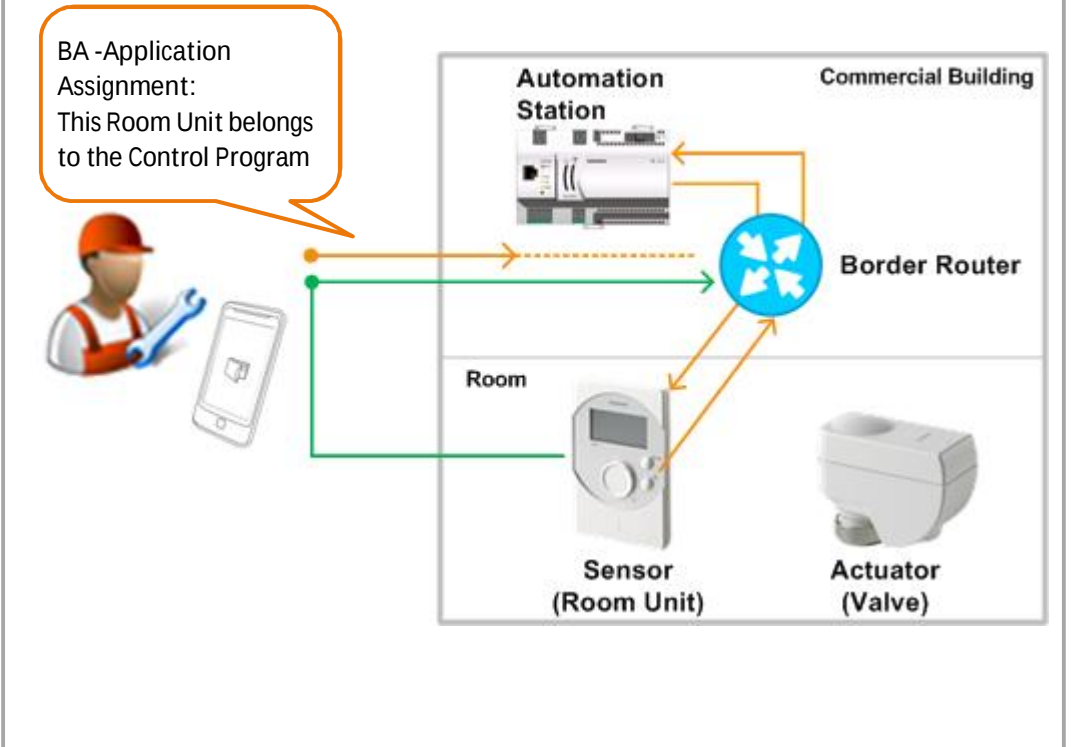


Fairhair System Services: Resource Discovery

Discovery: search for functions and data

- q Commissioning
 - q Device / network browsing
 - q Finding supporting services, e.g. for commissioning or security setup
 - q Finding tagged resources
 - q Dynamic scenarios, replacement,...
- q Note: RF network joining, and technology specific mechanisms are not in scope.

Commissioning example:



Design Principles

Eco-system independent, generic mechanism

Based on IETF CoRE / CoAP standards

- q Link Format (RFC 6690) and CoAP (RFC 7252, /.well-known/core)
- q CoRE Resource Directory, [draft-ietf-core-resource-directory](#)
 - q might also support http

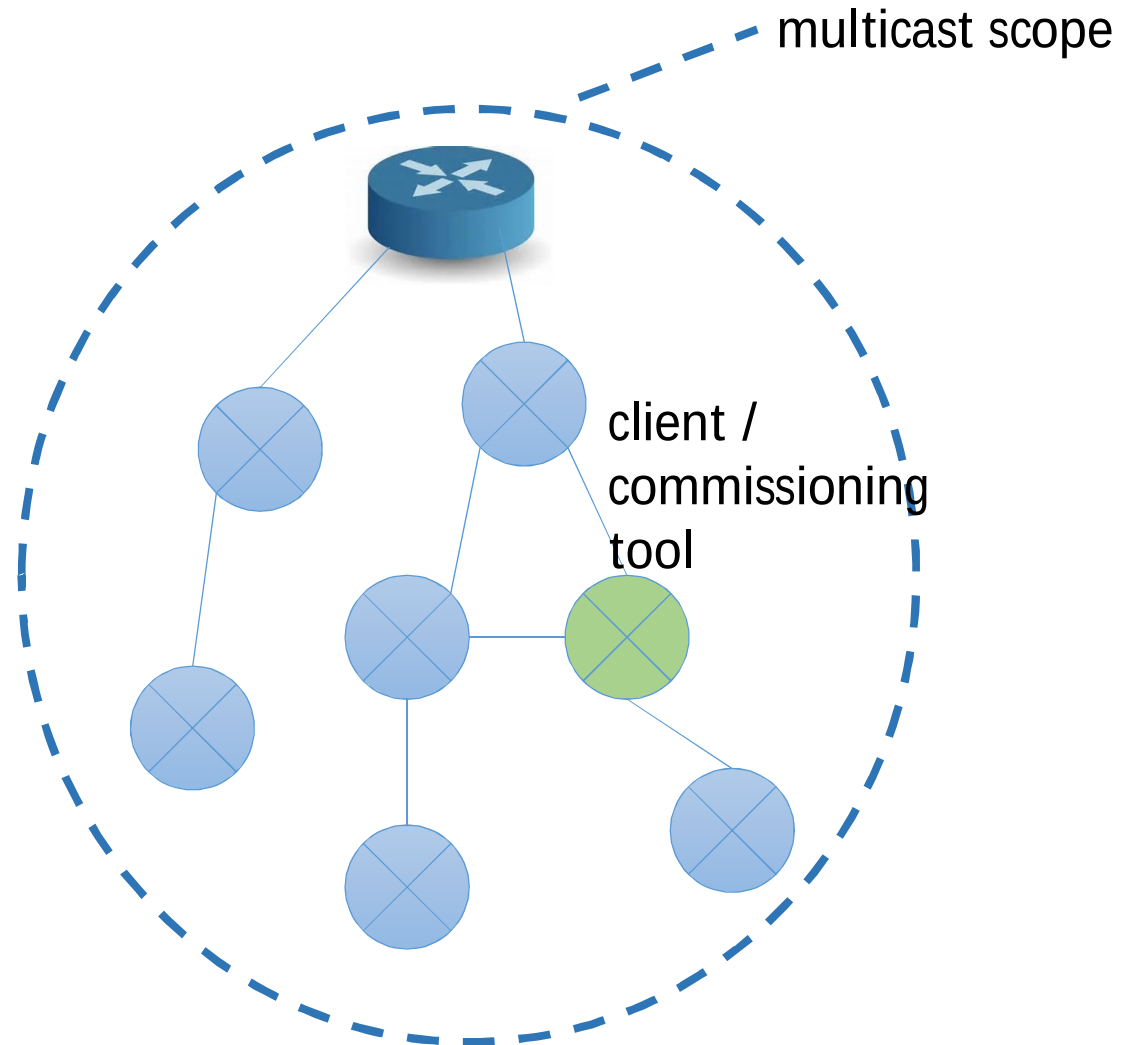
Scalability

- q number of resources
- q network topology, multicast scope
- q redundancy

à two complimentary mechanisms

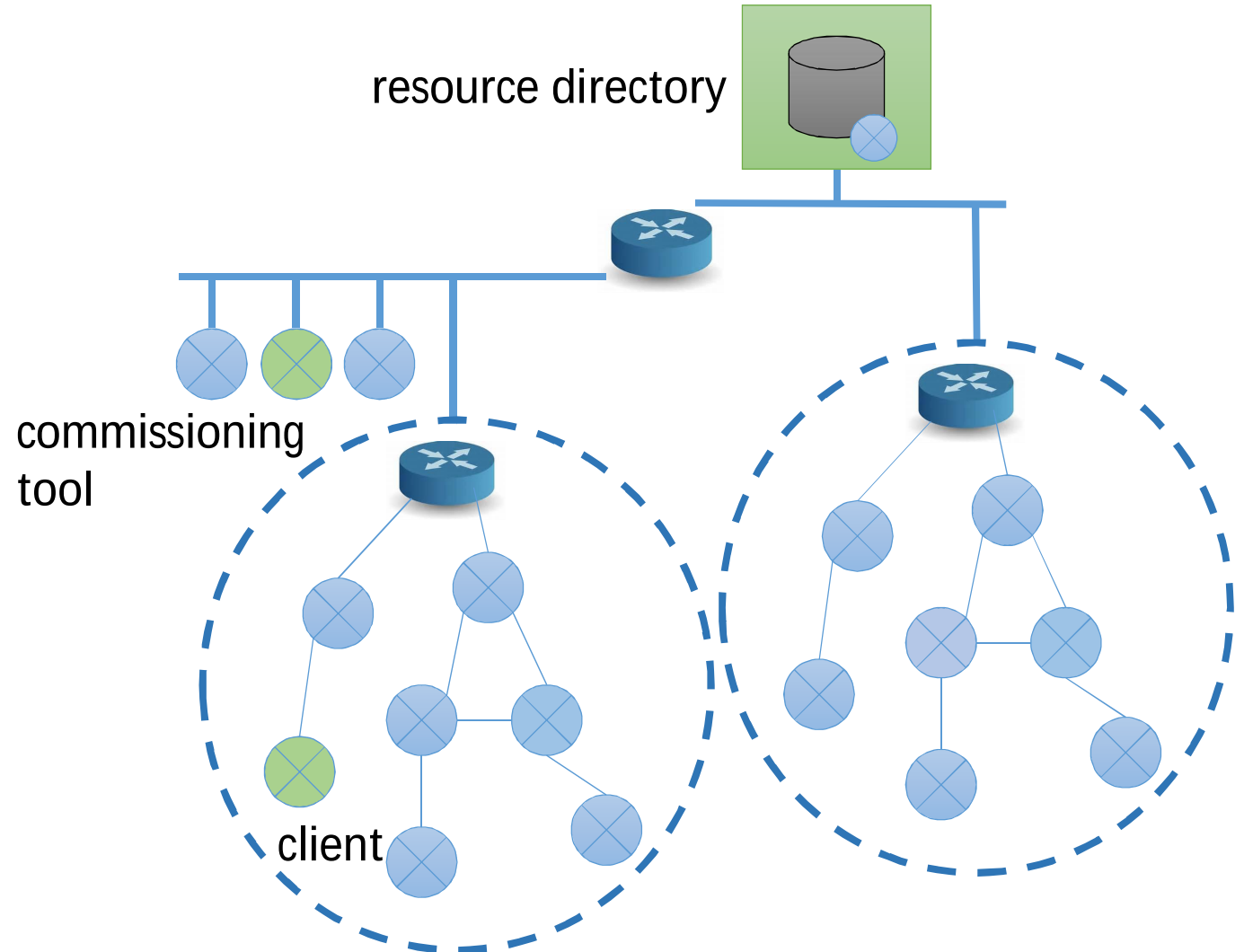
Distributed Discovery

- q Each node / device provides information about hosted resources
- q Interface: /.well-known/core for lookup
 - q multicast
 - q unicast
- q Query mechanism from CoAP Resource Directory
 - q multiple attributes
 - q wildcard mechanism
- q Semantics mainly defined by eco-systems



Central Discovery

- q Resource Directory holds information about resources
- q Interfaces accessed by unicast
 - q lookup interface
 - q registration interface
- q Query mechanism identical to distributed discovery

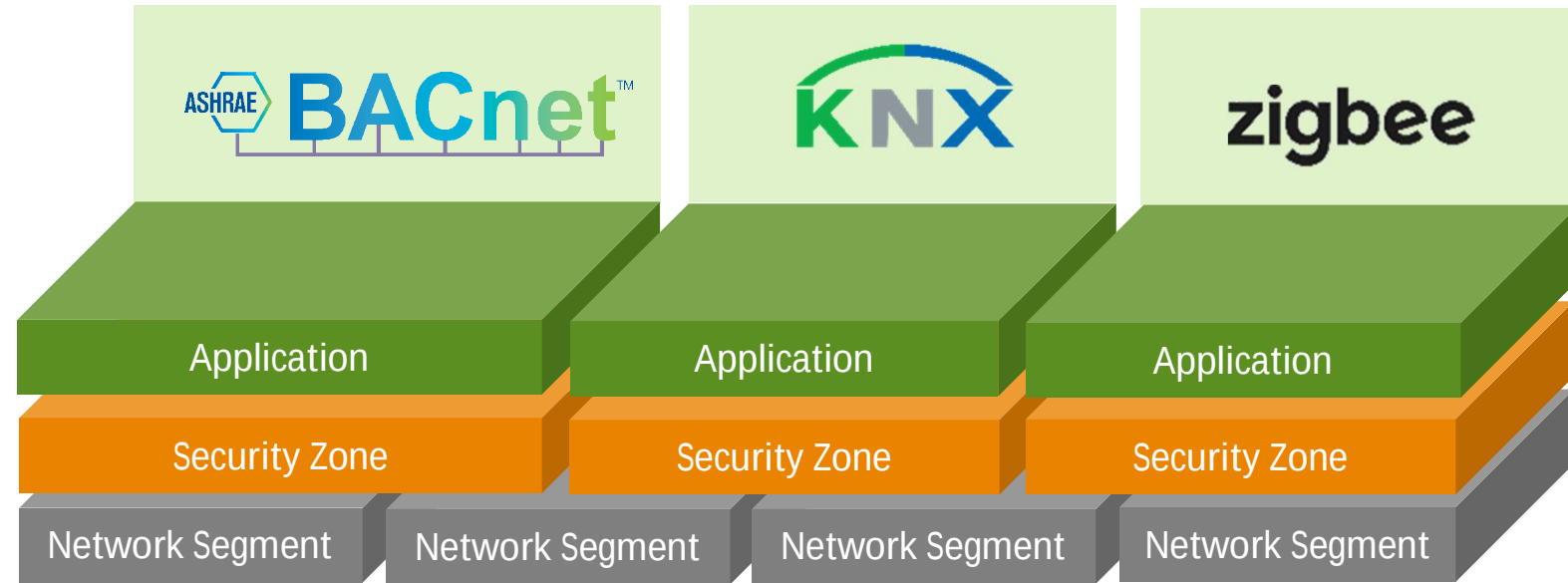


Fairhair System Services: Security



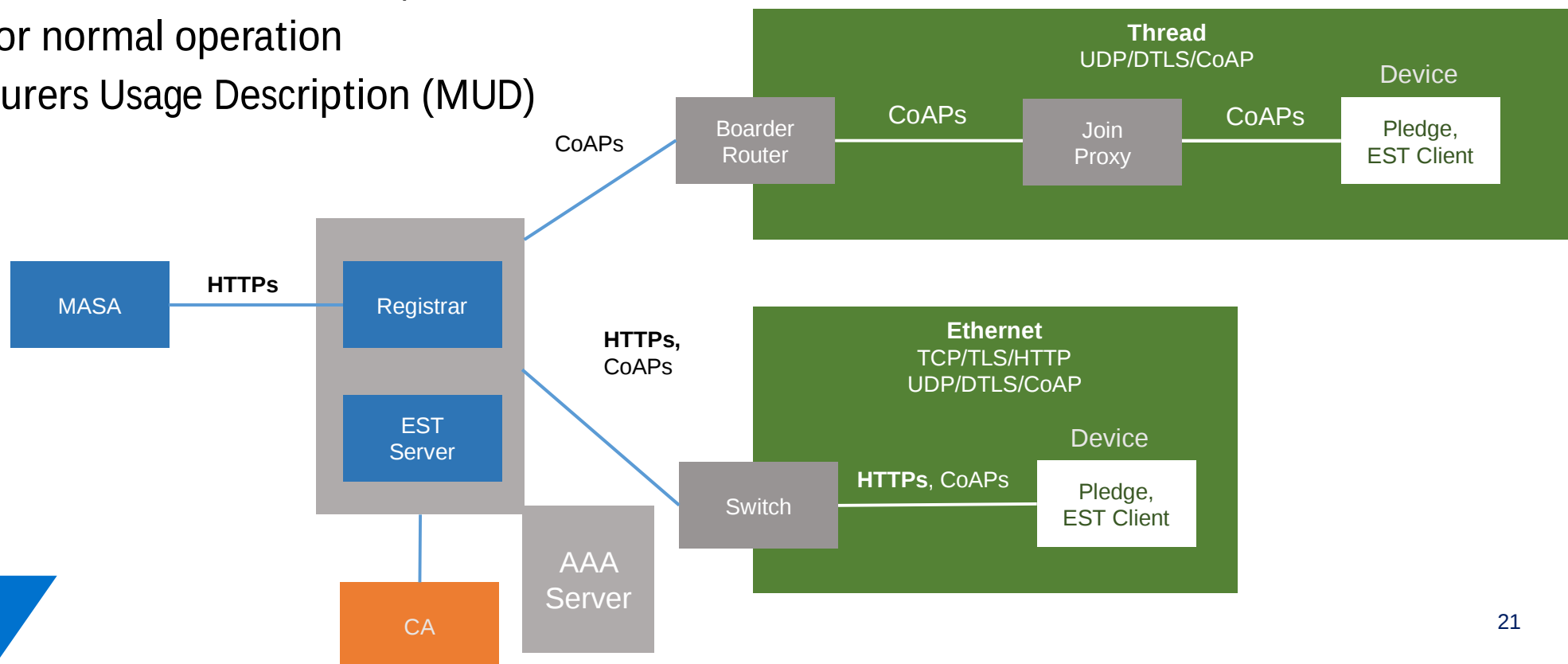
Overview of Fairhair security building blocks

- Application protocol authorizations
 - What is a device allowed to control/access?
- Security Zones
 - Authorize device to join operation domain
 - Issue device Operation Certificate
- Network Access Control
 - Authorize a device to join the network



Device enrollment: from Manufacturer to Operational Identity

- q ANIMA Bootstrapping
 - q draft-ietf-anima-bootstrapping-keyinfra-07, draft-ietf-anima-voucher-04
- q Enrollment over Secure Transport (EST), Re-enrolment
 - q RFC 7030, draft-vanderstok-ace-coap-est-02
- q EAP-TLS for normal operation
- q Manufacturers Usage Description (MUD)



Fairhair System Services: Security

- q **Enterprise-grade security** for resource-constrained devices
 - q Provides individual immutable identity to devices
 - q Applicable to all wired and wireless IP connectivity solutions – Wi-Fi, Ethernet
- q **Autonomous network bootstrapping** procedure
 - q Device provisioned with manufacturer-signed certificate off-factory
 - q Manufacturer-signed device certificate used to retrieve an operational certificate
- q **Transport layer security (DTLS)**
- q **Secure group communication**
- q **Resource-level authorization**

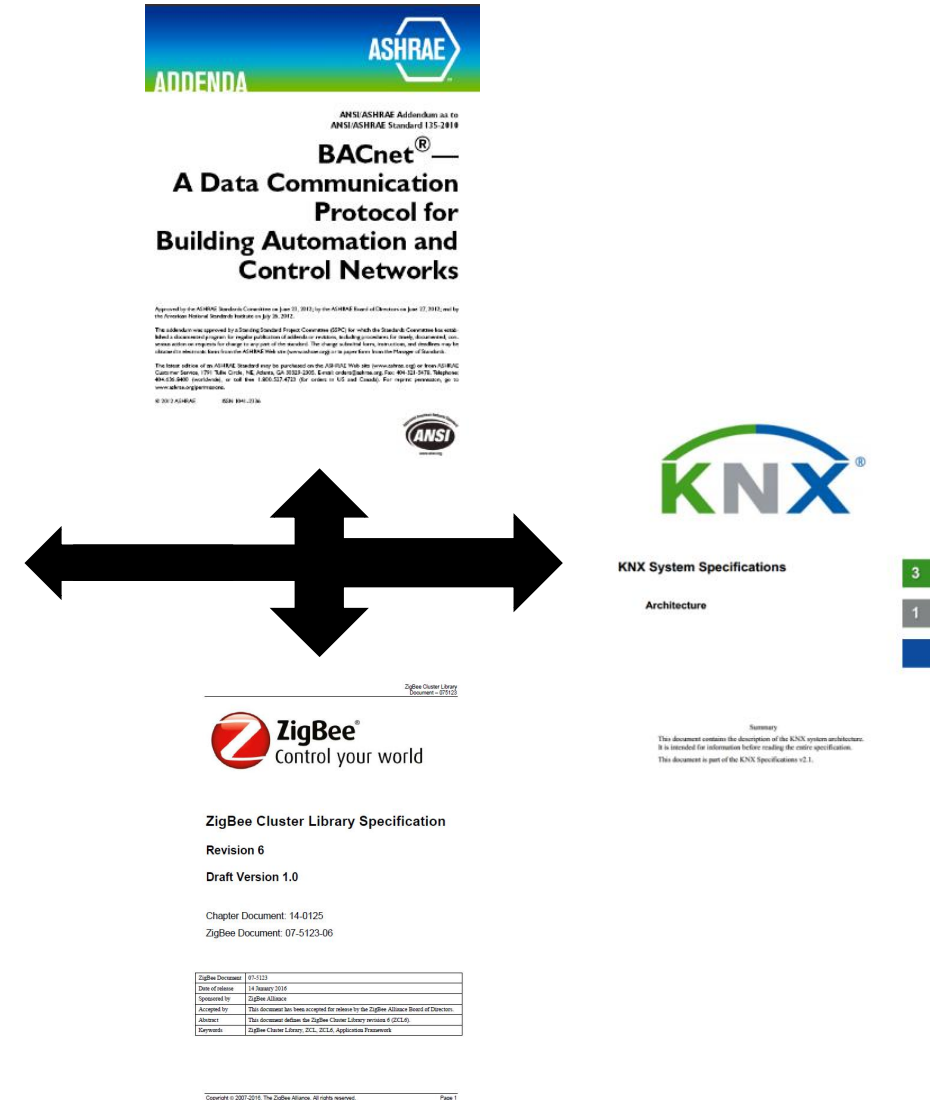
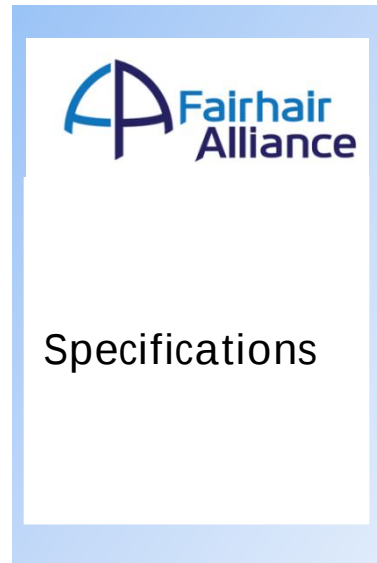
Summarizing...

Why Fairhair?

- q It specifies a set of **common “system services”** independent of the ecosystem-specific application model
- q It **leverages commonalities** across eco-system to overcome IoT fragmentation
- q It reuses (and extends when needed) standardized solutions based on IETF protocols
- q Fairhair members **bring in** the necessary **expertise on IoT and Building Automation & Lighting Control state-of-the-art**

Fairhair specification for ecosystems

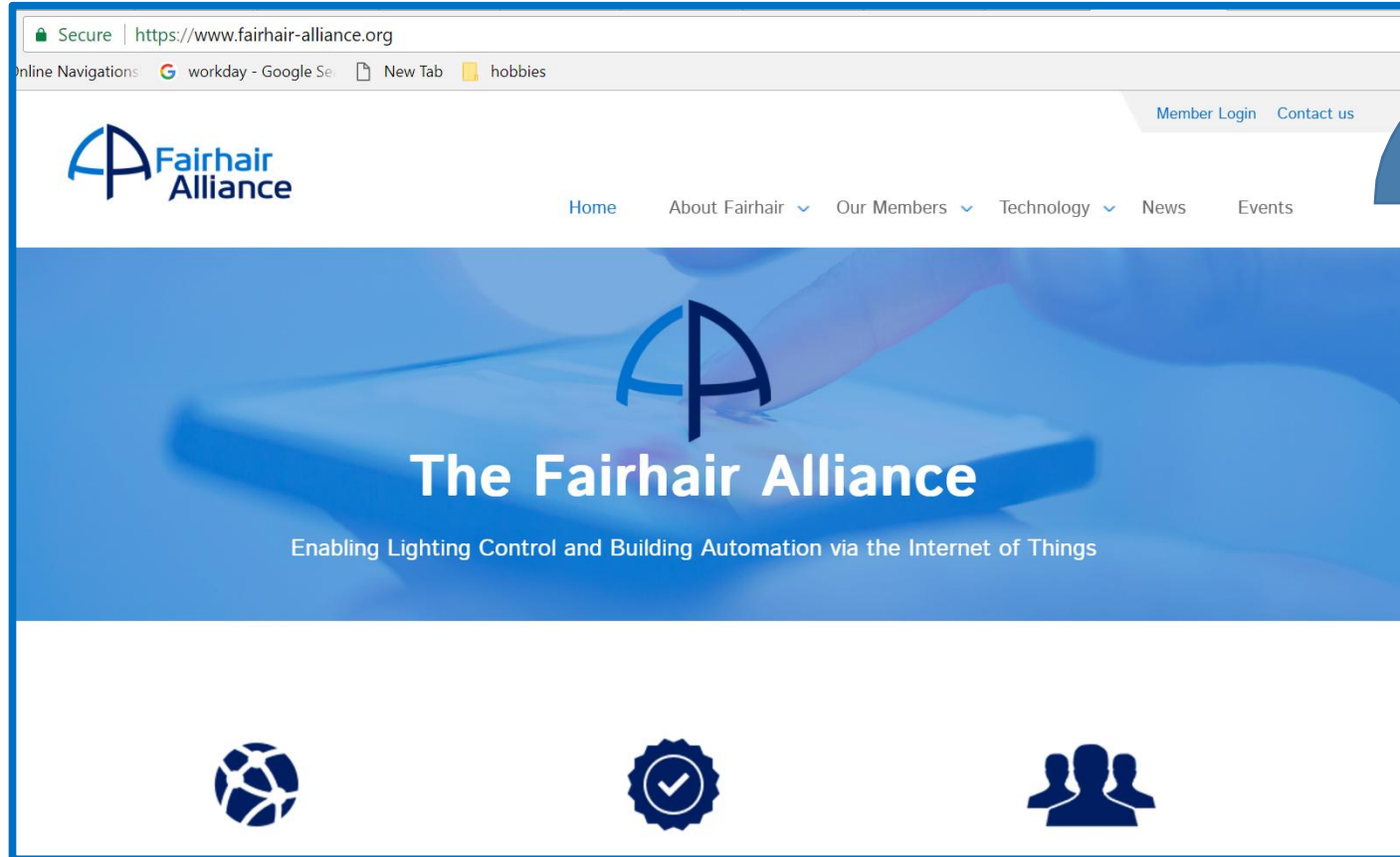
- q Fairhair Alliance to deliver **technical specifications for common system services.**
- q Solutions to be **adopted by target ecosystems** to facilitate transition to IoT.
- q Challenges:
 - q Different timelines
 - q Backward compatibility
 - q Often different requirements



Conclusions

- q Fairhair facilitates the IoT for buildings, via the introduction of a common IP-based wired and wireless infrastructure for building control
- q Fairhair provides a **flexible, cost-effective, end-to-end** solution
 - q Compatible with both wired-wireless IP connectivity technologies (e.g. Thread, Wi-Fi and Ethernet)
- q Fairhair specifications cover currently the **resource model, enterprise grade security** and **resource discovery**. **Group communication** and **event notification** are under discussion.

More info: www.fairhair-alliance.org



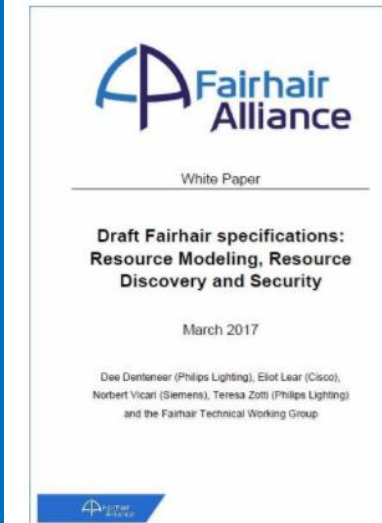
- Links to white papers:

Draft Fairhair specifications

Draft Fairhair specifications: Resource Modeling, Resource Discovery and Security

March 2017

This White Paper accompanies the Fairhair draft specifications that are being developed by the member organizations, for feedback and review.



Thank you

