



White Paper

Draft Fairhair specifications: Resource Modeling, Resource Discovery and Security

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Summary

This document introduces and accompanies the first three draft specifications by the Fairhair Alliance – Resource Modeling, Resource Discovery, and Security – along with a security requirements document. The draft specifications are a work in progress, and reflect Fairhair’s current direction and scope.

In order to validate the choices made by Fairhair, these drafts were made available in March 2017 to selected companies and organizations outside Fairhair. Feedback and comments were received, and these will be used to refine and improve the draft specifications. This White Paper reflects Fairhair’s direction and scope at the timing of writing, and the content is subject to change.

Contents

| | | |
|----|----------------------------------|-----|
| 1. | Fairhair goals and approach | p.3 |
| 2. | Resource Modeling specification | p.4 |
| 3. | Resource Discovery specification | p.5 |
| 4. | Security specification | p.5 |
| 5. | Review and feedback | p.6 |
| 6. | Contact details | p.6 |

1. Fairhair goals and approach

Fairhair is an alliance of leading companies from the lighting, building automation, IT and semiconductor industries, which aims to facilitate the Internet of Things (IoT) for commercial buildings. The Fairhair Alliance envisions a future where building-automation and lighting-control systems utilize the IoT. Our organization contributes to the realization of this future by providing IP connectivity solutions for resource-constrained devices to all interested application ecosystems, such as BACnet, KNX and ZigBee.

Technically, Fairhair develops specifications of common application-protocol services for building automation systems that are interworked by means of an IPv6 network infrastructure.

Figure 1 shows the scope of the specifications targeted by the Fairhair Alliance. The specifications will address all needed mechanisms (application services) to facilitate the IoT for buildings. These include for example security, resource discovery and network management, as well as a common resource model and specifications on the usage of CoAP.

On top of the application services, Fairhair anticipates more-specific adaptations from the ecosystems i.e. KNX, BACnet or ZigBee. These are depicted here as “Service Set” and might address ecosystem-specific mechanisms, e.g. to access trend-logs or to define functions specific to the ecosystems.

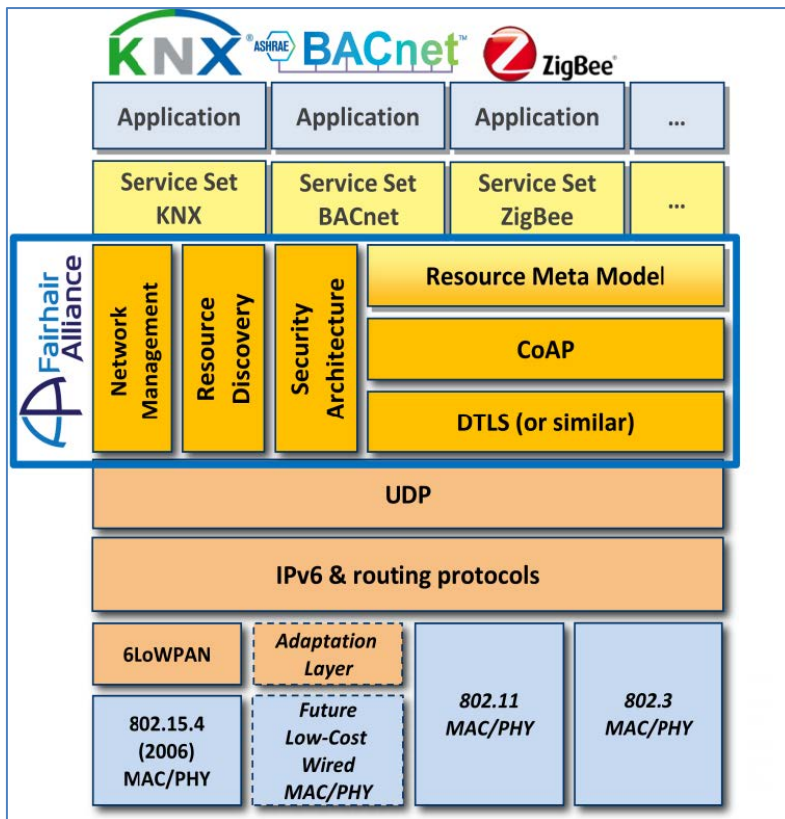


Figure 1. Scope of Fairhair specifications.

The specifications build as far as possible upon work in the IETF: guiding the use of existing RFCs as dictated by the requirements of the building automation industry, or driving new RFCs.

Fairhair's aim is to contribute these specifications for adoption by major building automation ecosystems, such as BACnet, KNX and ZigBee. Next to the obvious efficiency advantage, we believe that this harmonized approach enables co-existence of devices out of different ecosystems on the network. Thus, Fairhair's work facilitates the realization of a common, IPv6-based, wired and wireless infrastructure for building control. It brings building domains closer to each other and breaks down existing barriers to more advanced building and lighting control.

This document introduces and accompanies the first three draft specifications by the Fairhair Alliance. These drafts address respectively the Fairhair framework for Resource Modeling, concepts for Resource Discovery, and Security.

2. Resource Modeling specification

Fairhair specifies a common framework for resource modeling to enable each applicable ecosystem to represent its own data model according to common RESTful principles and common metadata, thus facilitating the transition to the IP and IoT domains.

In light of this, the Fairhair Resource Model defines a common RESTful interaction model to create, read, set, and delete data. In addition, it enables the harmonization of the usage of the CoAP protocol and its many options, and it specifies the usage of CBOR as the encoding format for message exchange.

Fairhair leverages the commonalities across the ecosystems to enhance interoperability and to allow the usage of common services. With this purpose, the Fairhair Resource Model standardizes names and definitions of the most common data types used across the different ecosystems, and it promotes their adoption.

The core of the Resource Model specification is represented by a superset of standardized metadata (i.e. data that provides information about other data).

Smart devices can potentially generate a vast quantity of data, however the semantic of this data is often implicit or exposed in ecosystem-specific formats. With the goal to enhance interoperability, Fairhair defines a common mechanism to annotate data and to clearly expose their semantics.

Furthermore, the Fairhair metadata model allows for ecosystem-specific extensions to address those use cases not common to all applicable protocols.

3. Resource Discovery specification

Fairhair Resource Discovery is used to discover resources according their semantic attributes/metadata in commissioning and run-time scenarios of Fairhair deployments.

The main requirements addressed are:

- seamless scalability from small (e.g. 10 devices) to large (1000+ devices) of networks
- support for different lifecycle phases
- limiting the effects of compromised devices (security)
- support of sleepy devices

Fairhair Resource Discovery is based on IETF CoAP discovery using Link Format ([RFC 6690](#)) resource descriptions. Fairhair supports both distributed discovery – usually via multicast queries to the “/.well-known/core” resource of devices – as well as unicast queries and registrations to a central resource directory ([draft-ietf-core-resource-directory](#)). Both complementary discovery modes support identical queries, i.e. distributed discovery also supports multiple query arguments.

The Discovery specification defines the mechanisms for discovery while the main part of the semantics (resource descriptions) is left to the ecosystems. Future additions will be in the specification of the security solution for discovery (currently, the draft specification contains a collection of requirements) and potentially a mechanism for discovery of groups.

4. Security specification

The Fairhair Security Group has developed a requirements document and a draft specification. Both documents consider what is necessary from a systemic point of view to protect the IoT device, the network, and other non-IoT systems. The goals are similar to those of the resource modeling group (stated above). The principle components of the architecture include minimal device system requirements, such as logging, time management, software update management, device identity and cryptographic support; and network access requirements, such as AAA and profile management.

Fairhair security aims to provide seamless onboarding through the ANIMA process ([draft-ietf-anima-keyprov-bootstrapping](#)), as well as automated profile management ([draft-ietf-opsawg-mud](#)). To maintain performance, elliptic key cryptography is used in conjunction with AES to provide strong protection.

There are three cornerstones to Fairhair security requirements. First, the network must provide necessary services to facilitate device protection. Also, devices will identify themselves and what they are to the network, so that the network can then be configured to provide appropriate access to devices. Finally, the requirements take into account various states the overall system may be in, including initial installation, initially commissioned, and accessible to the rest of an enterprise. Multitenancy is also intended to be addressed.

5. Review and feedback

The draft specifications are not complete, and reflect the first stage in Fairhair's thinking. However, they provide a good illustration of what Fairhair wants to achieve, and they constitute a solid step towards these goals.

Recognizing that the specifications come from a relatively small group of contributors, Fairhair decided to open up to a selected group of external companies and organizations, who were asked to review the draft specifications in March 2017.

Feedback and comments from this review process will be considered when creating the next versions of these draft specifications.

6. Contact details

Please use the contact details below to request more information on Fairhair's draft specifications, or to find out how to join the Fairhair Alliance and help to jointly realize the Internet of Things for buildings.

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