SEVENTH FRAMEWORK PROGRAMME
THEME 3
Information and Communication Technologies

Grant agreement for:
Collaborative project, Small and medium-scale focused research project (STREP)

Deliverable D3.4:

Library of Algorithms for Wireles Sensor Networks

Project acronym: WISEBED
Project full title: Wireless Sensor Network Testbeds
Grant agreement no.: 224460

Responsible Partner: TUBS
Report Preparation Date: May 31, 2011

Contents

1 Introduction

The overall goal of WP3 is to design and implement an algorithm library for heterogeneous sensor networks, the *Wiselib*. While the goals merely state to have a large number of algorithm implementations available to to the general public, we have added an extra step that should substantially increase the usefulness and sustainability of the library: We have developed a flexible and efficient framework based on C++ templates, allowing for algorithm development for heterogeneous networks. A first version was developed during WISEBED's first year. In the second year, it was extended and refined, and more algorithms were added. During the third year, we stabilized existing and extended the list of supported platforms, even integrated mobile devices such as Android and iPhone. The list of algorithms was also extended to nearly 80, with contributions from extern partners and other EU projects.

The architecture of the Wiselib was presented at EWSN 2010 [8]. We do not repeat design paradigms and technical descriptions in this deliverable, but rather refer to this publication.

Currently there are 78 algorithms in 12 categories in the Wiselib. It consists of three separate distributions:

"Incubation" contains algorithm implementations that do not use the generic C++ framework. They only compile on specific platforms or for specific simulators. Algorithms in this library are usually placed here for one of the following reasons:

- They are in a evaluation stage to be later ported to the C++ framework.
- They work under constraints that forbid using the framework (such as MAC layer algorithms, which often require direct hardware access).
- They are written in the context of other WISEBED-related research, where applicability to that research is of higher importance than compatibility to the C++ framework.

"Testing" algorithms use and extend the C++ framework. This distribution follows the "Release Early, Release Often" principle of Open Source. Every WISEBED partner can add algorithms, even if they undergo frequent changes.

"Stable" is a distribution consisting of algorithms that are tested for compatibility with the design principles of the C++ framework, and are known to run on different platforms. Adding algorithms here is restricted to the major Wiselib contributors—RACTI, TUBS, and UPC. These are allowed select mature algorithms from Testing and promote them to Stable.

In publications, only Testing and Stable are referred to as “the Wiselib”. This allows for clearer presentation, as we can focus on the major selling point of cross-platform development.

All three distributions will be released to the public under Open Source licenses. Large portions can already be accessed from the Wiselib website[1]. Some Incubation algorithms are available from other sources, such as the websites of their authors.

[1] http://www.wiselib.org

2 OS Facets

The OS facets are the connection to the underlying OS, abstracting hardware functionality for the algorithms. After three years, we have seven facets, with three derived concepts for specialized functionality. There are 11 software platforms supported, running on more than 10 different hardware platforms.

Table 1 provides an overview of all facets and the corresponding support in the various software platforms.

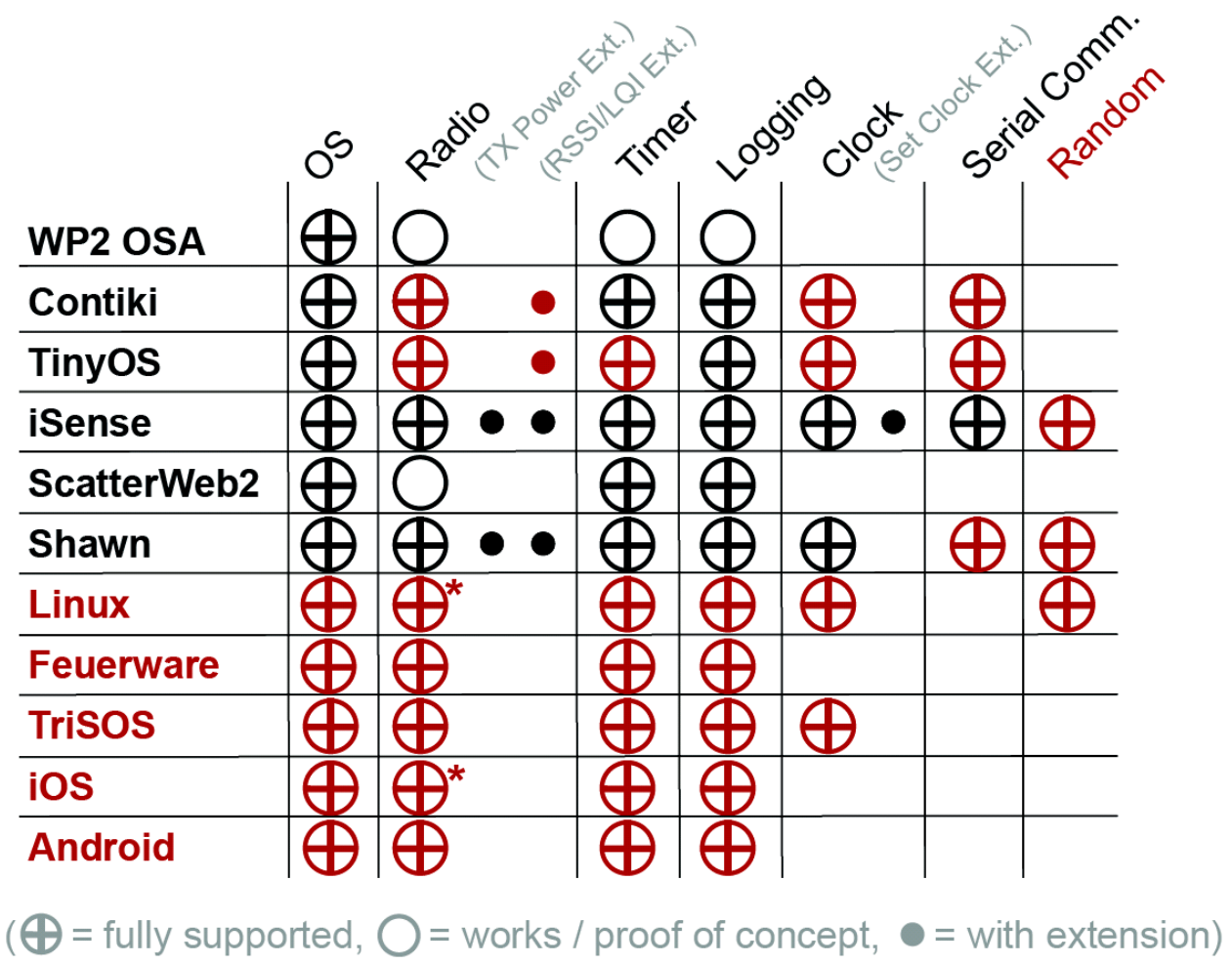

Figure 1: Support for various operating systems/firmwares in the Wiselib. Red marked facets are new in year 3.

2.1 WP2 OSA

OS Facet

Contributor(s):	TUBS, ULANC		
Status:	Fully supported	*Target:*	WP2 OSA

Radio Facet

Contributor(s):	TUBS, ULANC		
Status:	Works, proof of concept	*Target:*	WP2 OSA

Timer Facet

Contributor(s):	TUBS, ULANC		
Status:	Works, proof of concept	*Target:*	WP2 OSA

Debug/Logging Facet

Contributor(s):	TUBS, ULANC		
Status:	Works, proof of concept	*Target:*	WP2 OSA

2.2 Contiki

OS Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	Contiki

Radio Facet

Contributor(s):	TUBS, UZL		
Status:	Fully supported	*Target:*	Contiki

Extended Data Radio Facet

Contributor(s):	TUBS, UZL		
Status:	Fully supported	*Target:*	Contiki

Timer Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	Contiki

Debug/Logging Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	Contiki

Clock Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	Contiki

Serial Communication Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	Contiki

2.3 TinyOS

OS Facet

Contributor(s):	TUBS, TUD		
Status:	Fully supported	*Target:*	TinyOS

Radio Facet

Contributor(s):	TUBS, TUD, UZL		
Status:	Fully supported	*Target:*	TinyOS

Extended Data Radio Facet

Contributor(s):	TUBS, TUD, UZL		
Status:	Fully supported	*Target:*	TinyOS

Timer Facet

Contributor(s):	TUBS, TUD		
Status:	Fully supported	*Target:*	TinyOS

Debug/Logging Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	TinyOS

Clock Facet

Contributor(s):	TUBS, UZL		
Status:	Fully supported	*Target:*	TinyOS

Serial Communication Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	TinyOS

2.4 iSense

OS Facet

Contributor(s):	RACTI, TUBS, UPC, UZL		
Status:	Fully supported	*Target:*	iSense

Radio Facet

Contributor(s):	RACTI, TUBS, UPC, UZL		
Status:	Fully supported	*Target:*	iSense

Extended Data Radio Facet

Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Variable Transmission Power Radio Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Timer Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Debug/Logging Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Clock Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Settable Clock Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Serial Communication Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

Random Facet
Contributor(s): RACTI, TUBS, UPC, UZL
Status: Fully supported *Target:* iSense

2.5 ScatterWeb2

OS Facet
Contributor(s): TUBS
Status: Fully supported *Target:* ScatterWeb2

Radio Facet
Contributor(s): TUBS
Status: Works, proof of concept *Target:* ScatterWeb2

Timer Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	ScatterWeb2

Debug/Logging Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	ScatterWeb2

2.6 Shawn

OS Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Radio Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Extended Data Radio Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Variable Transmission Power Radio Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Timer Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Debug/Logging Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Clock Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Serial Communication Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

Random Facet

Contributor(s):	RACTI, TUBS, UPC		
Status:	Fully supported	*Target:*	Shawn

2.7 Linux

OS Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

Radio Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

Timer Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

Debug/Logging Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

Clock Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

Random Facet

Contributor(s):	Contribution: FRONTS		
Status:	Fully supported	*Target:*	Linux

2.8 Feuerware

OS Facet

Contributor(s):	FUB, TUBS		
Status:	Fully supported	*Target:*	Feuerware

Radio Facet

Contributor(s):	FUB, TUBS		
Status:	Fully supported	*Target:*	Feuerware

Timer Facet

Contributor(s):	FUB, TUBS		
Status:	Fully supported	*Target:*	Feuerware

Debug/Logging Facet

Contributor(s):	FUB, TUBS		
Status:	Fully supported	*Target:*	Feuerware

2.9 TriSOS

OS Facet

Contributor(s):	Contribution: G-Lab		
Status:	Fully supported	*Target:*	TriSOS

Radio Facet

Contributor(s):	Contribution: G-Lab		
Status:	Fully supported	*Target:*	TriSOS

Timer Facet

Contributor(s):	Contribution: G-Lab		
Status:	Fully supported	*Target:*	TriSOS

Debug/Logging Facet

Contributor(s):	Contribution: G-Lab		
Status:	Fully supported	*Target:*	TriSOS

Clock Facet

Contributor(s):	Contribution: G-Lab		
Status:	Fully supported	*Target:*	TriSOS

2.10 iOS

OS Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	iOS

Radio Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	iOS

Timer Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	iOS

Debug/Logging Facet

Contributor(s):	TUBS		
Status:	Fully supported	*Target:*	iOS

2.11 Android

OS Facet

Contributor(s):	RACTI		
Status:	Fully supported	*Target:*	Android

Radio Facet

Contributor(s):	RACTI		
Status:	Fully supported	*Target:*	Android

Timer Facet

Contributor(s):	RACTI		
Status:	Fully supported	*Target:*	Android

Debug/Logging Facet

Contributor(s):	RACTI		
Status:	Fully supported	*Target:*	Android

3 Library of Algorithms for Wireles Sensor Networks

This section describes the current state of algorithm implementations in the Wiselib. After three years we have 12 algorithm categories:

1. routing algorithms,
2. clustering algorithms,
3. time synchronization protocols,
4. MAC layer protocols,
5. localization algorithms,
6. energy saving schemes,
7. security,
8. graph algorithms,
9. target tracking,
10. data dissemination,
11. neighborhood discovery, and
12. data collection.

In the following sections, we report on the individual algorithms. For each, we describe

- Whether it is the implementation of original WISEBED research ("WISEBED algorithm"), or an algorithm from the literature ("Implementation"). In addition, some algorithms were also contributed by other EU-Projects ("Contribution").
- The algorithm category. For some, a sub-category is listed (for example, "Security / Cryptographic Algorithms" under Security).
- The distribution. For algorithms in Incubation, we also describe the platform for which they were developed.
- The release status. Algorithms that are available to the general public are marked "Public". Some algorithms are available only for WISEBED partners, these are marked "Restricted". This is usually done when publications need to be accepted at conferences or journals before the algorithm can be made public, to prevent third parties from accessing unpublished research.
- The WISEBED partner(s) that contributed the algorithm to the Wiselib.

3.1 Routing algorithms (20)

Destination-Sequenced Distance-Vector Routing (DSDV) (Implementation)

Category:	Routing		
Wiselib Distribution:	Stable	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[42]

Dynamic Source Routing (DSR) (Implementation)

Category:	Routing		
Wiselib Distribution:	Stable	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[29]

Tree Routing (Implementation)

Category:	Routing		
Wiselib Distribution:	Stable	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[46]

Flooding (Implementation)

Category:	Routing		
Wiselib Distribution:	Stable	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[1]

Topology Control Based Routing (WISEBED Algorithm)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	-
Description:	This is a Routing algorithm that establishes routing using any Topology Control algorithm. It exhibits how Wiselib algorithms can be templatized by other algorithms.		

TORA (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[41]

AODV (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[43]

Static (Contribution)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	G-LAB
Release Status:	Public	*References:*	-

Lazy (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	-

Secure Routing (WISEBED Algorithm)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-
Description:	Combine any routing algorithm with any security algorithm to setup encrypted message transfer.		

Greedy (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[53]

Optimized Link State Routing (OLSR) (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[14]

DYnamic Manet On-demand (DYMO) (Implementation)

Category:	Routing		
Wiselib Distribution:	Testing	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[12]

APSR (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[5]

GPSR (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[30]

Face (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[11]

GFG (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[21]

GRIC (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[45]

PAMPA (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation (LorienOS)	*Contributed by:*	ULANC
Release Status:	Public	*References:*	-

EfficientRouting (Implementation)

Category:	Routing		
Wiselib Distribution:	Incubation	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[25]

3.2 Clustering (12)

BFS (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[36]

DFS (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[50]

HDL (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[5]

MinMaxD (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[2]

LEACH (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[23]

Moca (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

Highway Clustering (Contribution)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	EU-Project FRONTS
Release Status:	Public	*References:*	-

BGU Clustering (Contribution)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	EU-Project FRONTS
Release Status:	Public	*References:*	-

LCA (Implementation)

Category:	Clustering		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[6]

WCA (Implementation)

Category:	Clustering		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[13]

TEEN (Implementation)

Category:	Clustering		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[37]

URNS (Implementation)

Category:	Clustering		
Wiselib Distribution:	Incubation	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[32]

3.3 Time Synchronization (5)

Flash Mob Organization (WISEBED Algorithm)

Category:	Time Synchronization		
Wiselib Distribution:	Incubation (iSense, Atmel ATmega48)	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[9]
Description:	Time synchronization algorithm that allows the organization of an event without sharing global time basis. Any node can initiate an event at any point in time.		

LTS (Implementation)

Category:	Time Synchronization		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	[51]

TPSN (Implementation)

Category:	Time Synchronization		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	[22]

HRTS (Implementation)

Category:	Time Synchronization		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	[15]

RBS (Implementation)

Category:	Time Synchronization		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[18]

3.4 MAC Layer (5)

Wisebed Virtual Link support (WISEBED Algorithm)

Category:	MAC Layer		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI, TUBS, ULANC, UZL
Release Status:	Public	*References:*	[7]
Description:	Enable message transfer between two nodes which are not able to communicate directly over their radio. Instead, messages are sent over connected PCs and then injected to the application, which can not differentiate between these virtual links and real physical ones.		

S-MAC (Implementation)

Category:	MAC Layer		
Wiselib Distribution:	Incubation (ScatterWeb)	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[55]

WiseMAC (Implementation)

Category:	MAC Layer		
Wiselib Distribution:	Incubation (ScatterWeb)	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[17]

MaxMAC (WISEBED Algorithm)

Category:	MAC Layer		
Wiselib Distribution:	Incubation (ScatterWeb)	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[27]
Description:	MaxMAC, is an Energy-Efficient Medium Access Control protocol(recently published at EWSN 2010) that targets at achieving maximal adaptivity with respect to throughput and latency. By adaptively tuning essential parameters at run-time, the protocol reaches the throughput and latency of energy-unconstrained CSMA, while still exhibiting a high energy-efficiency in periods of sparse traffic.		

AREA-MAC (Implementation)

Category:	MAC Layer		
Wiselib Distribution:	Incubation (Feuerware)	*Contributed by:*	FUB
Release Status:	Restricted	*References:*	-

3.5 Localization (8)

Triangulation (WISEBED Algorithm)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS
Release Status:	Public	*References:*	-
Description:	Localization algorithm based on geometrical triangulations. There are no Euclidean coordinates used—each node belongs to one or more triangles.		

Ad-hoc Positioning (Implementation)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS, UZL
Release Status:	Public	*References:*	[39, 31]

N-hop Multilateration (Implementation)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS, UZL
Release Status:	Public	*References:*	[49, 31]

Robust Positioning (Implementation)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS, UZL
Release Status:	Public	*References:*	[48, 31]

GPS-free Positioning (Implementation)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS
Release Status:	Public	*References:*	[52]

Greedy Localization (Implementation)

Category:	Localization		
Wiselib Distribution:	Testing	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	-

Emission Inhibition Localization (Implementation)

Category:	Localization		
Wiselib Distribution:	Incubation (Shawn)	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[44]

Virtual Raw Anchor Coordinates (Implementation)

Category:	Localization		
Wiselib Distribution:	Incubation	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[25]

3.6 Energy Saving Schemes (6)

LMST (Implementation)

Category:	Energy Saving Schemes / Topology Control		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Restricted	*References:*	[35]

FLSS (Implementation)

Category:	Energy Saving Schemes / Topology Control		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Restricted	*References:*	[34]

K-NEIGH (Implementation)

Category:	Energy Saving Schemes / Topology Control		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Restricted	*References:*	[10]

XTC (Implementation)

Category:	Energy Saving Schemes / Topology Control		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Restricted	*References:*	[54]

CBTC (Implementation)

Category:	Energy Saving Schemes / Topology Control		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Restricted	*References:*	[33]

Duty Cycling based on Ant Behavior (Implementation)

Category:	Energy Saving Schemes / Duty Cycling		
Wiselib Distribution:	Testing	*Contributed by:*	TUBS, UPC
Release Status:	Restricted	*References:*	[24]

3.7 Security (9)

AES (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[20]

ECIES (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[28]

SHA1 (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[16]

HARPS (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	UZL
Release Status:	Public	*References:*	-

SecureHDL (Implementation)

Category:	Security / Group Key Establishment		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

SecureDFS (Implementation)

Category:	Security / Group Key Establishment		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

FRONTS GKE (Contribution)

Category:	Security / Group Key Establishment		
Wiselib Distribution:	Testing	*Contributed by:*	FRONTS
Release Status:	Public	*References:*	-

Diffie-Hellman Key-Exchange algorithm (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[47]

Eschenauer-Gligor Key-Management algorithm (Implementation)

Category:	Security / Cryptographic Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	UBERN
Release Status:	Restricted	*References:*	[19]

3.8 Graph Algorithms (7)

DDFS (Implementation)

Category:	Graph Algorithms / Fundamental Graph Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	[4]

DBFS (Implementation)

Category:	Graph Algorithms / Fundamental Graph Algorithms		
Wiselib Distribution:	Testing	*Contributed by:*	UPC
Release Status:	Public	*References:*	[56]

TwoHop (Implementation)

Category:	Graph Algorithms / Coloring		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

Judged (Implementation)

Category:	Graph Algorithms / Coloring		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	[40]

MultiJudged (Implementation)

Category:	Graph Algorithms / Coloring		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

ParMultiJudged (Implementation)

Category:	Graph Algorithms / Coloring		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

Rand Coloring (Implementation)

Category:	Graph Algorithms / Coloring		
Wiselib Distribution:	Testing	*Contributed by:*	RACTI
Release Status:	Public	*References:*	-

3.9 Target Tracking (2)

Passive and Lightweight Target Tracking (Implementation)

Category:	Target Tracking		
Wiselib Distribution:	Testing	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[38]

Private Tracking (Contribution)

Category:	Target Tracking		
Wiselib Distribution:	Testing	*Contributed by:*	FRONTS
Release Status:	Public	*References:*	[38]

3.10 Data Dissemination (2)

Code Distribution (Implementation)

Category:	Data Dissemination		
Wiselib Distribution:	Incubation	*Contributed by:*	ULANC
Release Status:	Public	*References:*	[26]

Data Propagation with Guranteed Delivery for Mobile Networks (Implementation)

Category:	Data Dissemination		
Wiselib Distribution:	Incubation	*Contributed by:*	UNIGE
Release Status:	Public	*References:*	[3]

3.11 Neighborhood Discovery (1)

Echo (Contribution)

Category:	Neighborhood Discovery		
Wiselib Distribution:	Testing	*Contributed by:*	FRONTS
Release Status:	Public	*References:*	-

3.12 Data Collection (1)

SWAT Service (Contribution)

Category:	Data		
Wiselib Distribution:	Testing	*Contributed by:*	G-Lab
Release Status:	Public	*References:*	-

3.13 Summary

Finally, we summarize the various contributions from the WISEBED partners. Table 1 shows the algorithm counts for the 12 categories. The contributions per site are shown in Table 2—note that due to collaboration in algorithm development the total amount of contributions is greater than the number of algorithms. Finally, Table shows the size of the Wiselib distributions (Stable, Testing, Incubation).

Routing	20
Clustering	12
Time Synchronization	5
MAC Layer	5
Localization	8
Energy Saving Schemes	6
Security	9
Graph Algorithms	7
Target Tracking	2
Data Dissemination	2
Neighborhood Discovery	1
Data Collection	1
12 Categories	**78 Algorithms**

Table 1: Total amount of algorithms in the Wiselib.

FUB	1
RACTI	26
TUBS	12
UBERN	7
ULANC	3
UNIGE	12
UPC	12
UZL	5
External	7

Table 2: Contributions by site.

Stable	4
Testing	56
Incubation	18

Table 3: Number of algorithms in distributions.

4 Conclusion

During the three years of the Wisebed project, we designed and implemented a generic algorithm library for heterogeneous sensor networks, the Wiselib [8]. In the end of the project, it consists of 78 algorithms, running on 11 software platforms (sensor node operating systems, simulators, mobile devices), involving more than 10 hardware platforms—from tiny 8-bit systems up to powerful nodes such as the iMote2 or mobiles.

All partners contributed code to the Wiselib, by also collaborating in algorithm development and especially stabilization of OS facets. Even more, the Wiselib was used and extended by external partners, such as the EU-project FRONTS. Hence, we expect the Wiselib to be used over the end of the Wisebed project, since there are already matured plans in other projects, e.g. the EU-project SPITFIRE or the German project WSNLAB.

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