



 **SensMap**
Visualization & Monitoring Framework

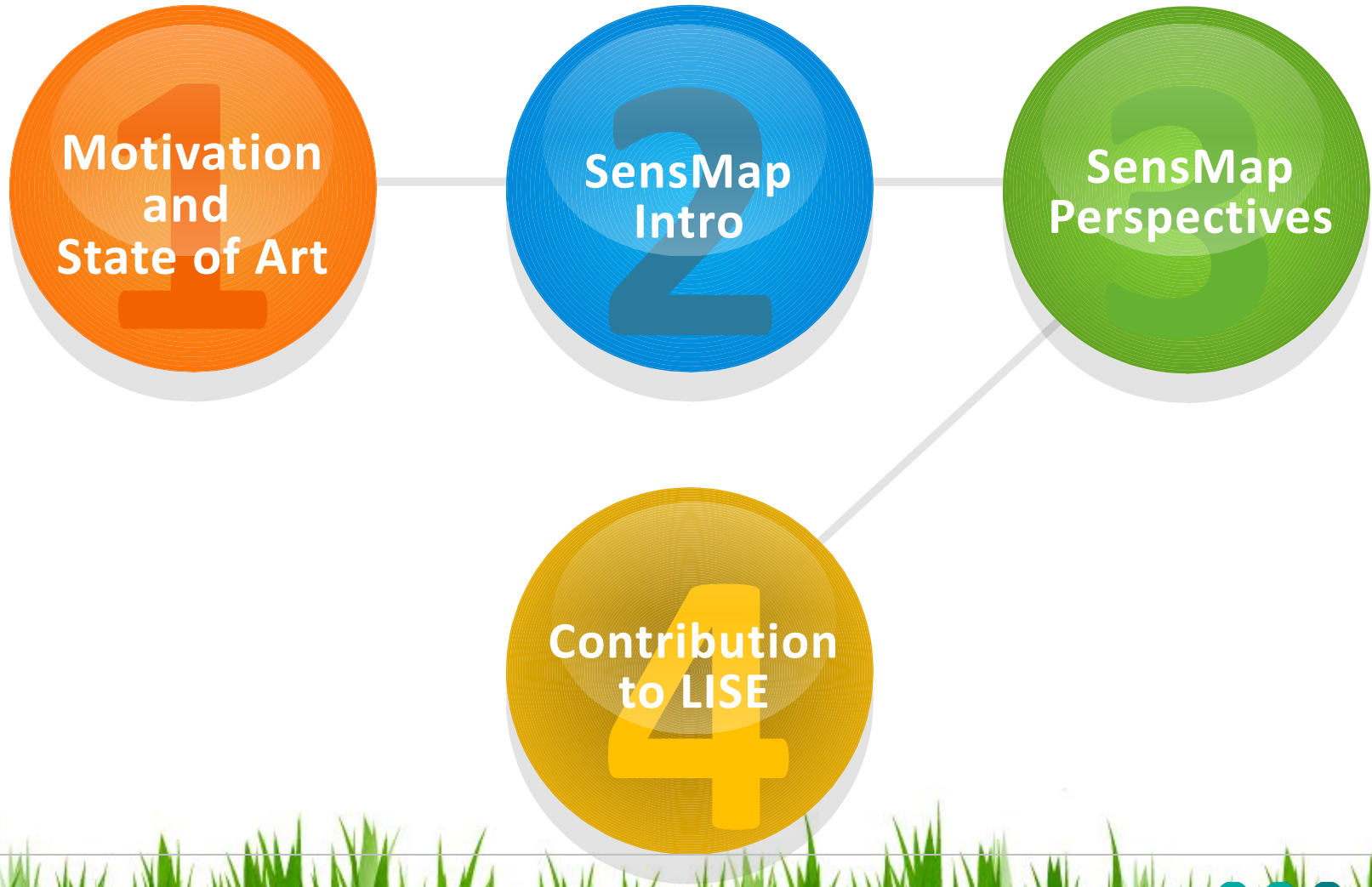
v0.2 (alpha) 

Web Framework for Complex Visualization of Indoor&Outdoor Sensing Systems

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Presentation flow



1

Motivation and State of Art

Common issue appeared during the several R&D projects aiming to bring the WSN systems into the real.

? where to store data

? how to represent them in database

? how to share them via Internet

? how to visualize data (3w: what, where, when)

? and nodes





Motivation and State of Art

Tens of cloud and visualization tools are offered to WSN community

MoteView

SAFECAST

NetWiewer

SeeControl

Nimbits

Sense

Xively

Octopus

SpyGlass

Etherios

TinyViz

ThingSpeak

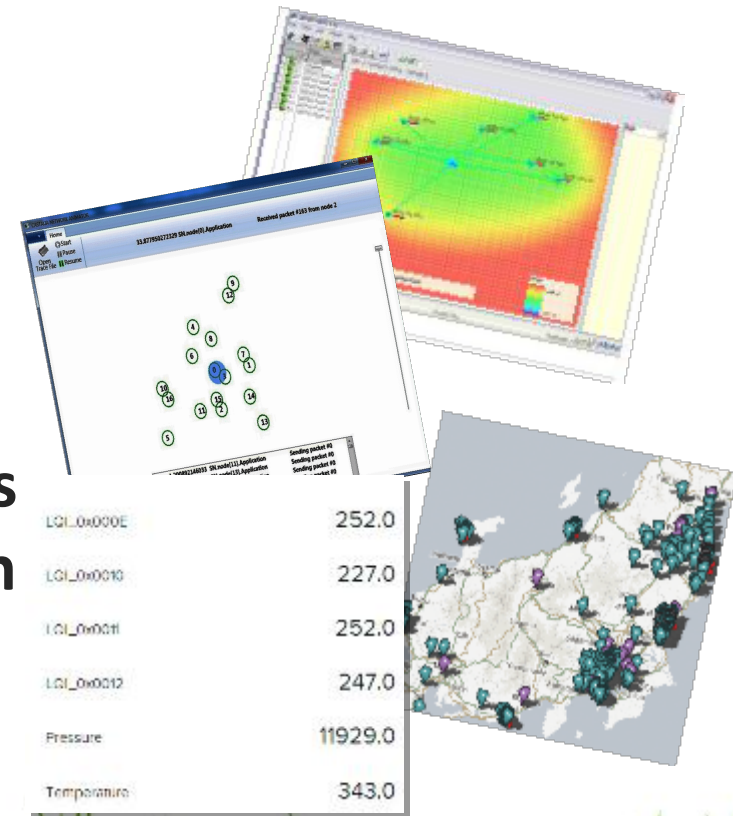
1

Motivation and State of Art

Why our requirements were not satisfied?

Very powerful and fashionable, however:

- tightly coupled with the specific hardware or phenomena
- desktop app
- missing location based capabilities
- limited sharing and authentication
- cloud without complex visualization, only one view perspective



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SensMap Intro



<http://www.wsnapp.wislab.cz/>

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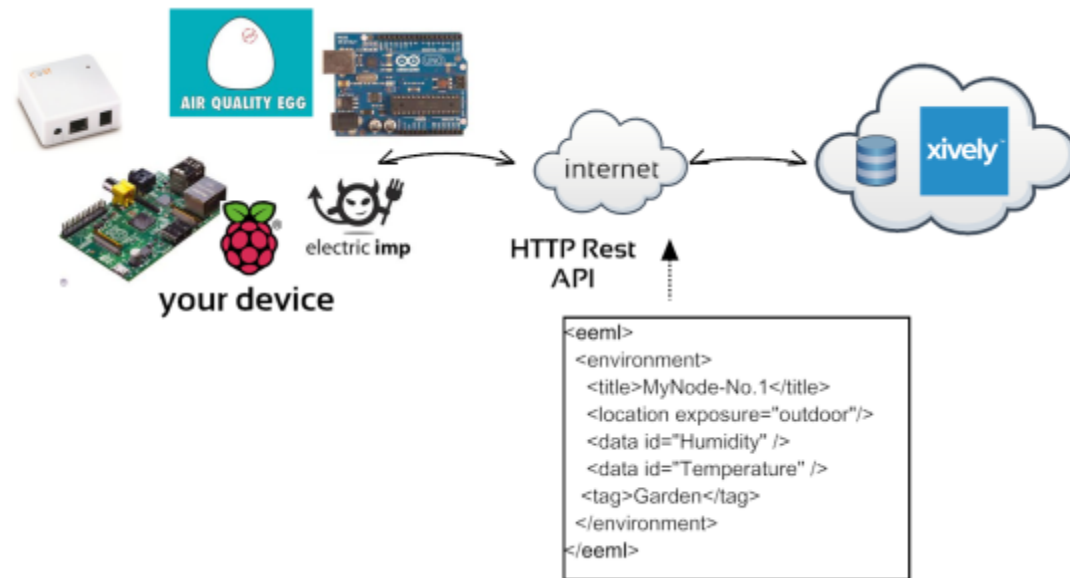
v0.2 (alpha) 

- Visualization framework running on the top of public cloud
- Independent on the node hardware used
- Visualizes sensor data, device location and its status
- Provides outdoor, indoor and topology perspectives
- Allows to manage nodes directly from GUI
- Searches node according user specification (area, phenomenon, developer)
- Shows topology and link quality

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SensMap Intro

Communication architecture



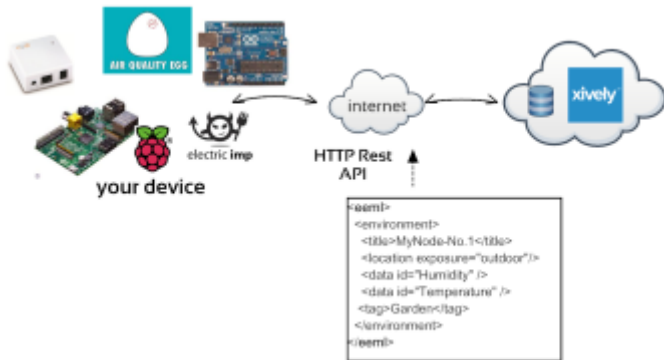
- Data are fed by gateway to the Xively web public cloud
- Xively provides HTTP Rest based API for the data upload
- Sensor data need to be parsed to the JSON, XML, CSV format

<https://xively.com/>

2

SensMap Intro

Update data to Xively - example



hurl

http://api.xively.com/v2/feeds/44975009.xml

PUT

follow redirects

+ add param - set post body

```
<?xml version="1.0" encoding="UTF-8"?>
<eeml xmlns="http://www.eeml.org/xsd/0.5.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-Instance" version="0.5.1" xsi:schemaLocation="http://www.eeml.org/xsd/0.5.1
http://www.eeml.org/xsd/0.5.1/0.5.1.xsd">
<environment>
<data id="humidity">
<current_value>75</current_value>
</data>
<data id="temperature">
<current_value>22</current_value>
</data>
</environment>
</eeml>
```

no auth HTTP basic

+ add header

X-APIKey

Your API key here !

Send

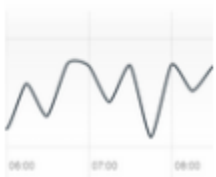
2

SensMap Intro

Xively tutorials

Services

Connect services to Xively to multiply the potential of your connected product or solution. Run analysis, create visualizations, render dashboards and more!



Visualizing Data with JavaScript

Learn how to make a page that displays your data how you want it.



Overlay Data with SensMap

A tutorial created by Wislab to showcase how to overlay Xively data on a map using the SensMap Visualization Framework.



Trigger Anything with Zapier

Set up a Xively trigger to activate your favorite web services, using Zapier

{ api }

cURL

How-to use Xively API on the command-line



SensMap Intro

Xively Location attributes

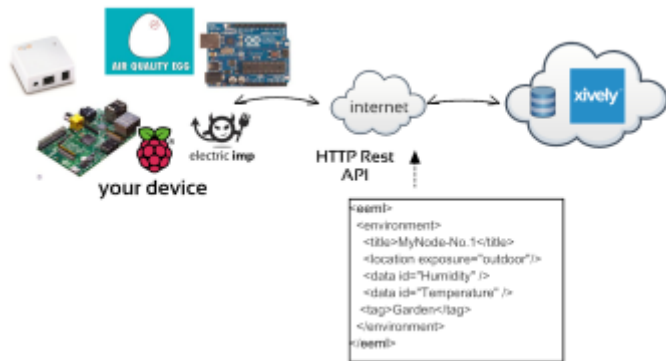
The following table lists the Feed resource's **location** attributes:

Attribute	Description	Required in an update?	Can be directly set?
disposition	Whether the "location" is mobile or fixed.	No	No
ele	The elevation of the device.	No	No
name	The name of the device.	No	Yes
lat	The latitude of the device.	No	Yes
exposure	Whether the location is indoors or outdoors.	No	Yes
lon	The longitude of the device.	No	Yes
domain	The domain of the location, i.e. physical or virtual.	No	Yes
waypoints	A list of locations for a mobile Feed. You cannot create, edit, or delete location waypoints. Xively creates a new location waypoint automatically in real time when the elevation, latitude, or longitude of a device changes. Location waypoints cannot be created using buffered historical data.	No	No

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SensMap Intro

Data representation in Xively



LQI_0xD00E	252.0
LQI_0xD010	227.0
LQI_0xD011	252.0
LQI_0xD012	247.0
Pressure	11929.0
Temperature	343.0

+ Add Channel

Location



Location Name: Duhajing/STK0
Latitude: 48.2270088286076
Longitude: 10.87430099006818
Elevation: floor: 5

Metadata

Tags: #AirQualityIndex #Humidity #Temperature
Description: Humidity and Temperature
Created: 2015-03-07T11:43:22.828196Z
Creator: wslab
Website:
Email:

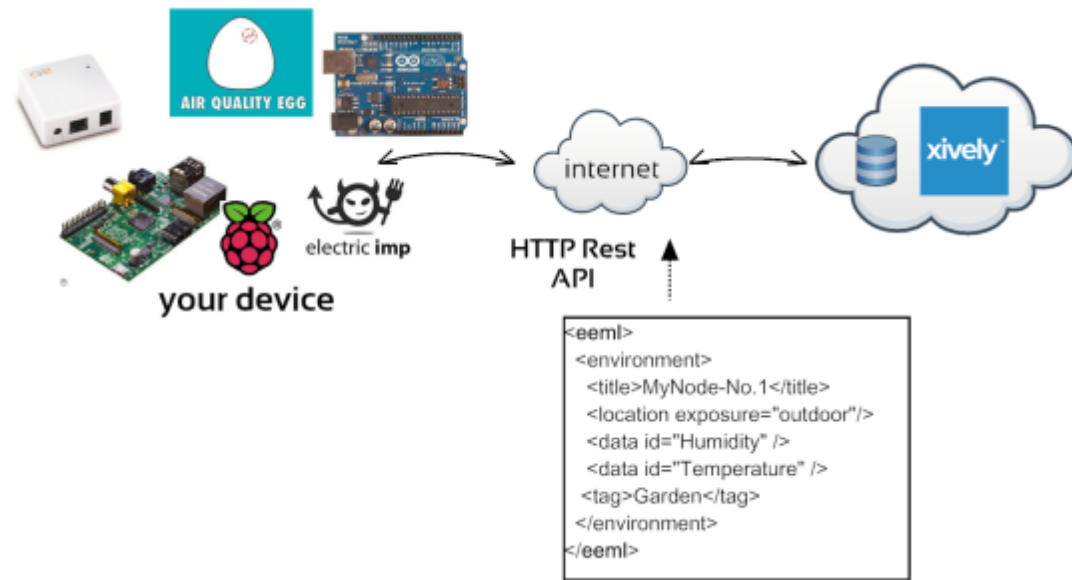
How do I update the location of devices?
Devices can save waypoints just as easily as observations.
[Read more about storing waypoints](#)

I want to interconnect my device with apps and services
Great! One way to do this is to use the feed as the hub that all of them can exchange data through. Set up their communication with the feed through the API. Visit our [help page](#) for other approaches.

2

SensMap Intro

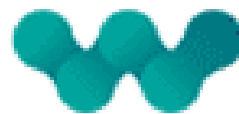
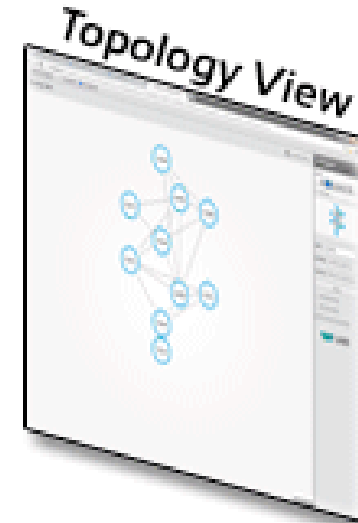
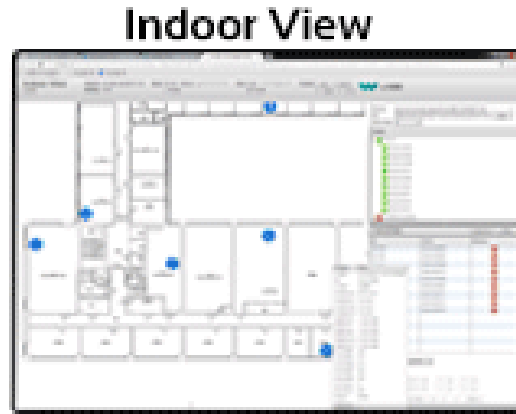
SensMap connection



- SensMap extends the visualization capabilities of Xively
- Running on separate public server (or in the user premises)
- Using WebSocket for data querying



SensMap View Perspectives



SensMap

Visualization & Monitoring Framework

v0.2 (alpha) 

SensMap View Perspectives



OutdoorView



- Nodes are visualized regarding given coordinates (latt, long)
- User can search nodes in geographical areas



Outdoor View Mode Now (REST) Now (socket) History

Position Longitude: 16.575965881347656 Latitude: 49.22739366807494

Save Position(s) Lock markers Hide inactive sensors
Reset Position(s) Disable tooltips Create hyperlink
Hide indoor sensors

Live **Frozen**

Selected  

Not Selected  

Property	Value
Title	Node:0x000D
extpanid	0xAABBCCDDEEFF1122
nwkaddr	0x000D
AnalogInput0	0.0 lux
AnalogInput1	0.0 raw adc
AnalogInput2	0.0 raw adc
AnalogInput3	0.0 raw adc
DigitalInput0	1.0 binary state
DigitalInput1	1.0 binary state
DigitalInput2	1.0 binary state
DigitalOutput0	0.0 binary state
DigitalOutput1	0.0 binary state
LQJ_0x0000	0.0
LQJ_0x000A	252.0
LQJ_0x000B	252.0
LQJ_0x000C	247.0
LQJ_0x000E	38.0
LQJ_0x0010	252.0

Select: Feed Node 0x000B (103131)

Compare to:
 Feed:Node:0x000D (103126)
 Feed:Node:0x000E (103123)
 Feed:Node:0x0013 (127800)
 Feed:Node:0x000A (101114)

Value Feed:Node:0x000B (103131) Feed:Node:0x000D (103126)

chart by amcharts.com

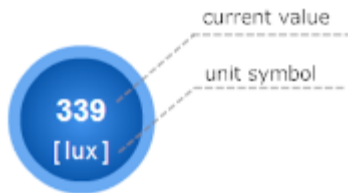
From: 23-07-2013 to: 24-07-2013

SensMap View Perspectives



IndoorView

- User can go inside the building from the OutdoorView
- Requires SVG map
- Data are visualized in the marker



Indoor View 1 Network: 0xAABCCDDEEFF1122 2 Mode: Now - REST 3 Node Scale 4 Position: Save, Reset X: 1438.3 Y: 470.2 wislab

Loaded Building: UTKO Mode: Now - REST History Node Scale ToolTip Lock markers

Key: [input] Apply
Username: [input] Building: [input]
ExtPanID: [input] Floor: 5

Nodes 5

- ✓ Floor 5
- ✓ Node:0x000A
- ✓ Node:0x000B
- ✓ Node:0x000C
- ✓ Node:0x000D
- ✓ Node:0x000E
- ✓ Node:0x0011
- ✓ Node:0x0010

Selected Nodes: Select All Reset

ID	Name	Remove

Datastream: [dropdown]

Graph Range

Start: 07/04/2013 14:55
End: 07/04/2013 14:59

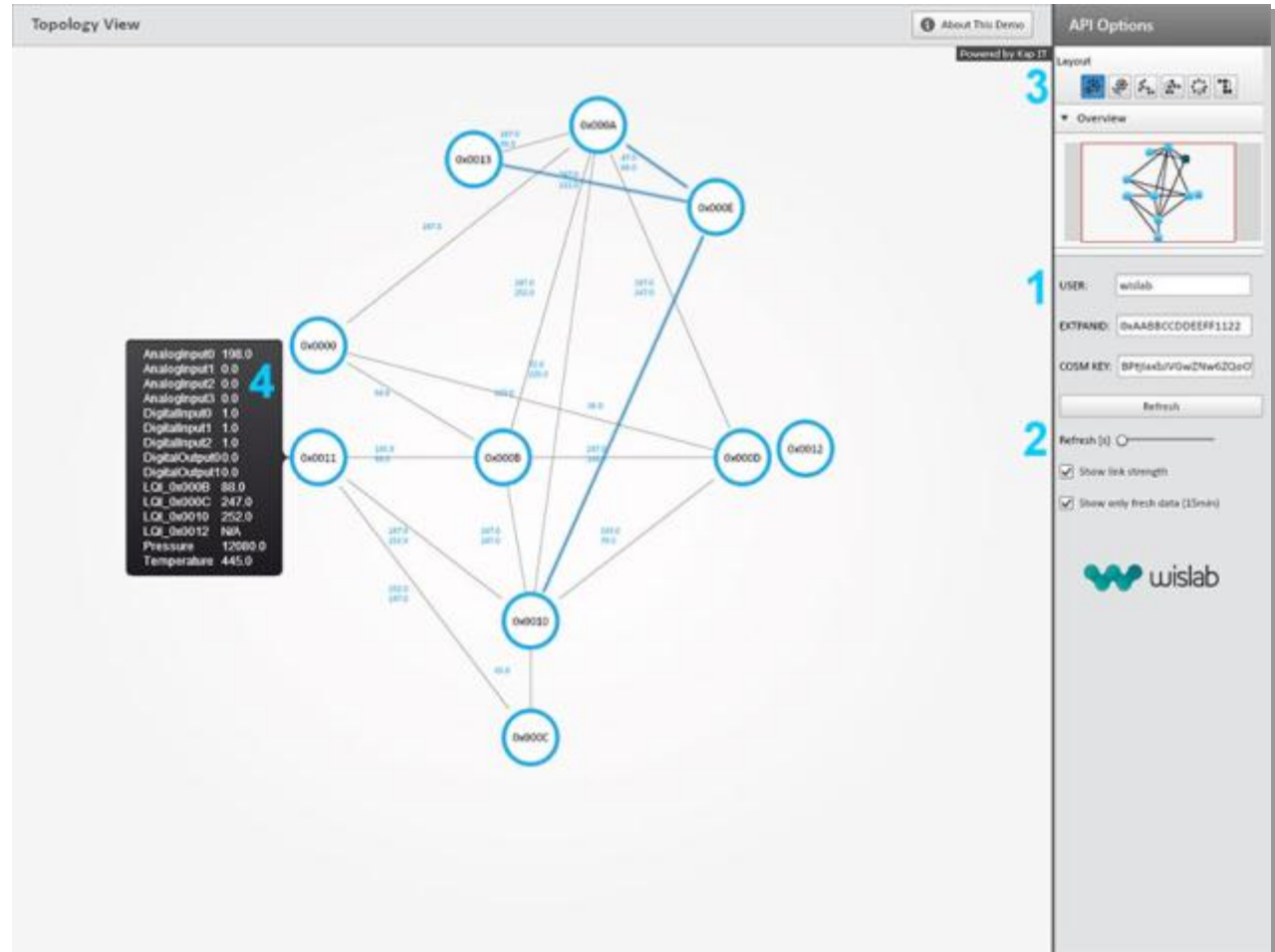
Show Graph Export

SensMap View Perspectives



TopologyView

- Indicates the network topology based on the LQI or RSSI
- LQI/RSSI is fed as common sensor data
- Feasible for troubleshooting



For Location Based Services, the SensMap provides:

- ✓ Easy and fashion tool for nodes (objects, people) visualization
 - ✓ SensMap is for free, try it: <http://www.wsnapp.wislab.cz/>
 - ✓ In alpha version, the non-frequent outdoor tracking is integrated
 - ✓ The moving path may be be recorded and exported with some modification
-
- Performance is restricted by the limitation of server clouds in terms of data (position) update interval, e.g. 15 sec in Xively, also the WebSocket limits the tracking possibilities
 - Indoor tracking will be integrated in future releases
-
- ✓ Wislab is developing own SensorCloud optimized for the frequent queries, also by integrating cloud and SensMap together in order to avoid latencies



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Thank you for attention

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