

MOBISTYLE MOtivating end-users Behavioral change by combined ICT based modular Information on energy use, indoor environment, health and lifeSTYLE

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Prepared for: European Commission EASME Project Advisor: Mr Pau Rey-García

**Prepared by:** Dena Arabsolgar HOLONIX, HOLX September 30, 2017



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## Publishable executive summary

MOBISTYLE Things Connector aims to reach the following practical goals: adapt and customize, together with Whirlpool product development team, the Holonix i-LiKe platform solution (originally applied to industrial production environments) to manage the data-flows from smart home appliances, following their lifecycle and providing data to the MOBISTYLE Modular Information Services.

The expected result is an easy and quick access to smart home appliances data flows and lifecycle information while the appliance is installed into his final position. The Holonix i-LiKe solution is made able to acquire 3 data flows from 3 different home appliances types. The solution is complete and available, targeted at TRL 7 of development and testing. Further development and implementation will be done during the project duration according to the final position that will be given to the Whirpool appliances for the demo cases.

#### Key words:

Appliances, connection, IOT, data flow, data visualization, dashboard, real time, indoor environment, energy consumption.





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## 2 Introduction

The overall aim of MOBISTYLE is to raise consumer awareness and motivate behavioral change by providing attractive personalized combined knowledge services on energy use, indoor environment, health and lifestyle, by ICT-based solutions. Providing more understandable information on energy, health and lifestyle will motivate end-users to change their behavior towards optimized energy use and provide confidence in choosing the right thing. It will offer consumers more and lasting incentives than only information on energy use.

In WP5 Practical ICT based tools will be developed, including:

- MOBISTYLE things connector that will allow users to visualize real time data about the appliances available in their indoor space (home, resident, office, etc.)
- MOBISTYLE modular information for Trust and Privacy that will allow a safe and private system compliant with European targets
- MOBISTYLE Open Users Platform that will allow users to have an ad hoc platform able to get data defined in WP3 and WP4.

The Things connector to be developed for MOBISTYLE has to:

- read data from the MOBISTYLE infrastructure
- show to the user the data available into the infrastructure
- manage different type of users
- allow the user to configure and personalize his own dashboards
- allow a user to have more than one single dashboard, to show different groups of data coming from different *sensorized entities*.

The described features will support one of the main aims of MOBISTYLE, which is to create consciousness in the end-user and to help people becoming curious about energy and lifestyle. To do so, the HOLONIX i-LiKe solution had been adapted and further developed to support home appliances monitoring and, when the data will be made available, to monitor indoor environments and physiological data acquired from wearable devices.

The MOBISTYLE Things connector, in its first version due in month 12, focuses on allowing the user in monitoring the information coming from the appliances (energy consumption, status, temperature, status of the doors, etc.). The objective is to prove the ability of the HOLONIX i-LiKe solution to monitor and to visualize actual data coming from the MOBISTYLE infrastructure. As soon as the chosen sensors will be installed into the buildings, wearable devices will be provided to users and their data will start flowing through the MOBISTYLE infrastructure, other dashboards will be created and other "things" will be connected. At the end, the connected "things", will be appliances, sensors data coming from the buildings, and data coming from wearables, all flowing through the MOBISTYLE infrastructure.

Deliverable 5.1 will mention the preliminary analysis done on the information collected through the workshops and the focus groups. Then it will show the outcomes of Task 5.1 and the actual working version of the MOBISTYLE Things connector software.



## 3 Preliminary activities done

1 O B I S T Y L E

The complete and technical description of the Architecture of the final expected MOBISTYLE platform is included into D4.2 due at 30/09/2017, too. Through D4.2 it is possible to understand how the Things connector is correlated to the overall MOBISTYLE platform. References are done to avoid repetitions of basic content.



Figure 1. MOBISTYLE general architecture

More detailed information about the final requirements of the platform are going to be deployed and described in the incoming months and in other deliverables. Those material will be used to improve the Things connector and to focus the incoming expected developments of the MOBISTYLE platform.

## 3.1 Baseline of expected MOBISTYLE functionalities

To answer to the question "which will be the main function of the MOBISTYLE platform?", a series of Workshops had been held in Amsterdam during 14<sup>th</sup> and 15<sup>th</sup> of February, where IT partners HOLONIX, HIGHSKILLZ and DEMO actively participated. Other workshops with potential end users, in the form of focus groups, had been guided by Academic partners and the outcomes had been shared in the consortium. Both are described in D2.2, which has to be considered as the baseline of the developments chosen for the MOBISTYLE Things connector.

For each DEMO CASE, the expected baseline functionalities had been grouped into 4 different kinds of IT requirements. Three of the groups had been considered at a preliminary reasoning as MOBISTYLE CORE FEATURES, and they are:

- **Things Connector**, grouping features that can be related to a Dashboard in which the data can be shown in real time. Which data have to be shown can change by demo case and by purpose.



- **Suggestions to the users**, that could be activated according to the values received by the sensors and will be defined with the objective to let the user being aware of his energy consumption and of his lifestyle.
- **Collaborative and Social features**, to be developed as gamification or serious gaming applications.

Other functionalities identified are, for now, considered as out of scope of the MOBISTYLE CORE.

For example the integration with a personal calendar, weather forecast, tourist information about the city, suggestions for dinner, managing cleaning services, inventory of the food available in the fridge, diet suggestions.

They will not be immediately excluded, but analyzed deeper inside the consortium and in correlation with the information that will come from incoming co-creation workshops.

## 3.2 Internal validation of the approach

The developments of Things connector had been shared with IRI-UL as a preliminary validation, according to the outcomes of D2.3, including the "10 commandments" list.

On top of this, the Things connector real time data visualization is confirmed coherent with the outcomes of the Focus Groups and the needs expected from the potential users.

According to the development roadmap, under discussion in cooperation with WP4, the front end visualization will be modified and improved according to the indications and the requirements that will be defined during the growing up of the project.

One additional suggestions for the future is the possibility to create real time dashboard for expert users and a simplified one for normal users, in order to approach the expectation of a "customized" dashboard.

## 4 HOLONIX i-LiKe solution for MOBISTYLE Things connector

#### 4.1 Introduction and general features

As described into D4.2 (chapters 3.2, 4, 4.4), the MOBISTYLE Things connector platform is a dedicated extension and customization of the existing HOLONIX i-LiKe solution.

This allows many general features to be native, as for example:

- 1. Possibility to manage different "types" of entities.
- 2. Possibility to manage as many single entities as required, called "sensorized entities".
- 3. Possibility to manage different level of users:
  - a. *Administrator* who can have complete access to the platform and create new types of entities;

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- b. *Managers* who can create new single entities and manages accesses allowing users to visualize data from the single entities;
- c. Common users can visualize the entities and real time data correlated.
- 4. Possibility to personalize the way in which the information is visualized (which data, which labels, in which order, etc).
- 5. Possibility to get the data from the MOBISTYLE platform and eventually even from external data sources.
- 6. Etc.

According to the description of the Deliverable in the MOBISTYLE official Description of Action, the examples are related to Whirlpool appliances actually connected.

### 4.2 MOBISTYLE Things Connector screenshots

In the following pages, the images taken from the actual version of the Things connector will explain the main features available and how the user can use it.

Available appliances examples are:

- A fridge
- A washing machine
- A dryer

Actually three Whirlpool fridges are connected, and a specific sensorized entity had been created to monitor them remotely. The fridge with serial number WPR333388JFB6 is used in the following images.

The flow which is described through the following images follows the process for the creation, configuration and usage of the dashboard with information about the fridge:

CONFIGURATION PHASE (used by Administrator)

- 1. User profile configuration
- 2. Creation of the WHR Fridge sensorized entity type
- 3. Configuration of the WHR Fridge dashboard
- 4. Creation of the "status" field in the WHR fridge dashboard
- 5. Configuration of the "status" field in the WHR fridge dashboard
- 6. Configuration of the "temperature" field in the WHR fridge dashboard

VISUALISATION PHASE (used by Appliance User)

- 7. Fridge dashboard complete, in simple version
- 8. Fridge dashboard complete, in "for expert" version, with additional fields
- 9. Fridge sensorized entity created for appliance with serial number WPR333388JFB6
- 10. Connected fridge available and monitored through the dashboard

Afterward, the following screenshots will show the example of the dashboard created for a washing machine and a dryer machine.

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#### **CONFIGURATION PHASE**

Creation of a user profile, in this example creation of the personal profile for Mr. Giorgio Whirlpool.

					Giorgio Whirlpool - Whirlpool 👻	Ą
SENSORIZED ENTITIES	S Modify profile					
of Sensorized entities	÷					
COMPANY	🎮 Avatar	General information				
	Whirlpool	Usemame	giorgio.whirlpool	Old password		
	SENSING THE DIFFERENCE	First name	Giorgio	New password		
		Last name	Whirlpool	Repeat new password		
		Email	companyAdmin@whirlpoc			
			Save			

Figure 2. Things connector User profile configuration

Creation of a typology of entity with specific characteristics: in this case an example of a model of connected Whirlpool fridge.

MOBISTYLE	_	🦛 Giorgio Whirlpool - Whirlpool - Ψ
SENSORIZED ENTITIES	C New sensorized entity type	Clear at
C Sensorized entities	*	
COMPANY	🖾 Avatar	General info
		Base device url
	~	http://dal1.holonix.biz/devices/{(deviceId)}
		Alarms url
		/endpoints/history/alarms
		Alarms path
		/alarms
		States un
		/endpoints/history/state
		State path
		/state/code
		Name
		Whirlpool fridge
		Description
		Connected fridge and refrigerator
	✤ Sensorized entity status endpoints Status url	
	/endpoints/status	
	Status path	
	Sensorized entity maintenance types	

Figure 3. Fridge entity type creation





The administrator can configure a dashboard for the specific model of connected Whirlpool fridge.

MOBISTYLE		Giorgio Whirtpool - Whirtpool 👻 🗘
SENSORIZED ENTITIES	C Dashboard Whirlpool fridge	Update
of Sensorized entities	*	
COMPANY Users	Example json	
	Dashboard  Add pane	

#### Figure 4. Fridge dashboard configuration

All parameters that need to be visualized into the dashboard of all that model of connected fridges can be configured, as for example status on/off and temperature.

MOBISTYLE				Giorgio Whirlpool 👻 🗘
SENSORIZED ENTITIES	Dashboard Whirlpool fridge	Status Panel title	Delete pane Status	Update
COMPANY	÷	Column ratio Widgets	1-2	
₩ Users	Cxample jon      '     Cample jon      '	New widget Widgets 1 1 1 1 Widget title Type Column ratio Datasource	X Panel title	
	C Dashboard Add pane Status	Value Options	<b>3</b> =	
			Close	







#### D5. 1: MOBISTYLE Things connector

MOBISTYLE				Giorgio Whirlpool - Whirlpool -
sensorized entities	C Dashboard Whirlpool fridge	Status	Delete pane	Update
C Sensorized entities	÷	Panel title	Status	
COMPANY	*	Column ratio Widgets	1-2 *	
🚰 Users	Example json	New widget		
		Widgets 1	×	
	3 "deviceTypeId": 4, 4 "modelNumber": "859526515959", 5 "firmwarRevision": "VIB885662"	Widget title	Power	
	6 - "highLevelDeviceStatus": { 7 "deviceCode": "bae72a96-10c6-4c76-a9 8 "tenantCode": "bub7.	Туре	status	
	9 "subtenantCode": "whp",	Column ratio	1-2 *	
		Datasource	Status •	
	Dashboard	Value	highLevelDeviceStatus[status].power	
	Add pane	Options		
	<b>≡</b> Status			
	O Power			
	ON			
			Close	

Figure 6. Fridge dashboard configuration: status field configuration

MOBISTYLE				Giorgio Whirlpool - Whirlpool 👻 🛕
SENSORIZED ENTITIES	C Dashboard Whirlpool fridge	Status	Delete pane	Update
© Sensorized entities	<b>*</b>	Panel title	Status	
COMPANY	•	Column ratio Widgets	1-1 *	
📽 Users	Example json	New widget		
	Image: State State         Tear (Sector)           1         1         1           2         Tear (Sector)         1           3         Tear (Sector)         1           4         Tear (Sector)         1           5         Tear (Sector)         1           6         Tear (Sector)         1         1           7         Tear (Sector)         1         1           7         Tear (Sector)         1         1         1           7         Tear (Sector)         1 <t< th=""><th>Options</th><th>5 F 3 D</th><th></th></t<>	Options	5 F 3 D	
		Widgets 6 1	×	
	C Dashboard	Widget title	Fridge Temperature	
	Add pane	Туре	number •	
	≡ Status	Column ratio	1-3 •	٥
	O Power	Datasource	Status •	O Fridge Door
	ON	Value	highLevelDeviceStatus[status].fridge	Closed
		Options		
	O Last Update			O Fridge Temperature
	2017-06-15 23:32:28			5
		_	Close	

Figure 7. Fridge dashboard configuration: temperature field configuration







#### **VISUALIZATION PHASE**

Here follows the preview of the dashboard configured for the model of fridge proposed. Two possible versions are proposed, according to a selection of data available coming from Whirlpool: a simple version for not expert users, and a more complete version for expert users.

REED ENTITIES Rensorized entity types Issorized entitles NY RTS	3 "deviceTypeId": 4, 4 "modelNumber": "850526515 5 "firmwareRevision": "W108 6 - "highLevelDeviceStatus":	885662", { 5-10c6-4c76-a9ae-9c0d9f6a874b",		<b>≯</b> ₹ 1 0		
	Dashboard Add pane Status					0
	O Power ON Q Last Update			ezer Door DSed		
				emperature (°C)	O Fridge Temperature (°C)	
		<b>'-06-15</b> :32:28	-	22	5	
	<b>≡</b> Extra		٥	■ Ajar Status (door not completely clo	sed)	٥
	O Party Mode	O Vacation Mode	O Fridge Eco Night	<b>O</b> Fridge	O Freezer	
	Off	Off	On	Off	Off	

Figure 8. Fridge dashboard complete - simple version



Figure 9. Fridge dashboard - other available data that can be used in the "for experts" version

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The entity type of the model of connected fridge can be declined into specific "sensorized entities" which are related to a specific object with its own serial number. The configuration of the dashboard had been defined through the previous steps, and here are made available the specific data coming in real time from the real object.



Figure 10. Fridge - sensorized entity for serial number WPR333388JFB6

					Giorgio Whirlpool - Whirlpool -					
SENSORIZED ENTITIES	🔹 Dashboard 🎤 Maintenance	🜲 Alarms 🛛 🗠 Analysis 🗄	E Configuration							
Sensorized entity types	Whirlpool fridge - WPR3333	Whirlpool fridge - WPR333388JFB6								
COMPANY Tusers	Status									
	0	Power	() Fre	ezer Door	O Fridge Door					
	► WORKING		Closed		Closed					
	O Last Update		O Freezer Temperature (C)		O Fridge Temperature (C)					
	<b>2017-09-19</b> 10:55:51		-16		8					
	Extra		Ajar Status (door not completely		d)					
	O Party Mode	O Vacation Mode	O Fridge Eco Night	O Fridge	O Freezer					
	Off	Off	Off	Off	Off					

Figure 11. Fridge - dashboard for serial number WPR333388JFB6





In the following images are caught the screenshots about the sensorized entity type and about the dashboard of two other kind of objects: the washing machine and the dryer.

MOBISTYLE				Giorgio Whirlpool - Whirlpool 👻 🛕
SENSORIZED ENTITIES	C Sensorized entity type Whirlpool washin	ng machine		Configure dashboard
of Sensorized entities	*			
COMPANY				
🖆 Users	🖿 Avatar		General info	
			Base device url	
			http://dal1.holonix.biz/devices/({deviceld})	
		-	Alarms uri	
			/endpoints/history/alarms	
			Alarms path	
			/alarms	
		V 1 1/1	States url	
		le l	/endpoints/history/state	
			State path	
			/state/code	
			Name	
			Whirlpool washing machine	
			Description	
	ů		Whirlpool connected washing machine	
	𝗞 Sensorized entity status endpoints			
	Status url			
	/endpoints/status			
	Status path			
	Sensorized entity maintenance types			
	<ul> <li>Sensorized entity maintenance types</li> </ul>			











#### D5. 1: MOBISTYLE Things connector

М	0	в	i.	s	т	v	i.	F	
~	O	D		Э		Υ.	L	E.	

			Giorgio Whirlpool - Whirlpool -
SENSORIZED ENTITIES	New sensorized entity type		iii Clear all
COMPANY	*		
our Users	🖆 Avatar	General info	
		Base device url http://dail.holonix.biz/devices/((deviceld)) Alarms url /endpoints/history/alarms Alarms path /alarms States url /endpoints/history/state	
		State path /state/code Name Whirpool dryer	
		Description Whiripool connected dryer	
	€ Sensorized entity status endpoints		
	Status url		
	/endpoints/status Status path		
	Sensorized entity maintenance types		



MOBISTYLE					Giorgio Whirlpool - Whirlpool 👻 🛕	
azed entities densorized entity types nsorized entities	<pre>6 - "status": { 7</pre>		•			
NY	C Dashboard					
ers						
	Add pane					
	≡ Current Cycle		Status		•	
	O Cloth Type	O Duration (min)		O Power	O Daily Energy	
	Silk	65		ON	0	
	O Remaining Time (min)	O Energy Consumption		O Door	O Cycle Counter	
	65	181		Closed	647	
		O Phase		Q Last Update		
	Pr	ogramming		<b>2017-03-27</b> 11:41:04		
	<b>≡</b> Settings				٥	
	O Dryness Level	O Water Conductivity	O Touch Tone Level	O Category	O Key Look	
	4	1	Medium	Clothes Dryer	Unlocked	

Figure 15. Dryer dashboard



#### 4.3 How to access a public demo of the MOBISTYLE Things connector

The official public URL to access the Things connector demo is the following:

#### demo.holonix.biz/MOBISTYLE/

The system can be accessed through different common users and different administrators, whose credentials are available easily asking via email at the following address: <u>research@holonix.it</u>.

## **5** Conclusions

The activities carried out till now have reached the objective to create a MOBISTYLE dashboard to be used as example and starting point to explain to the potential users and to the demo cases participants how the system could work for them.

It should be enough complete to ensure that the information that can be monitored by a common user are a lot and very flexible.

From now on, the existing system will be improved in strong cooperation with the MOBISTYLE partners both on the back end side, with IT partners, and on the front end side, receiving requirements and suggestions from Demo Case holders and Academic Experts.

