

GoFlex HEMS

HEMS parameter configuration to maintain flexibility offering and implementation

Document	Parameter configuration to maintain flexibility offering and implementation
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Version history

Version	Date	Comment
/	Before 27.2.2019	Unversioned, first proposal, from/to/max FO length/cyc/cyc dur/cyc fin dl
v1	4.3.2019	Document header, footer and title given. Revision of proposal, according to skype meeting and wrap-up mail (27.2.19 Papageorgiou Ioannis), added parameter max no requests/day
V2	5.4.2019	Added parameter Suspend time, device switch, example 4 (demonstrating cyclic device operation)
V3	9.5.2019	Configuration parameters and examples revised.

Configuration options

On the platform HIQ Universe, from the main menu end user can access to new page “My Things”, where is shown set of all consumers connected to HEMS. As shown on the image below, each consumer is presented as dashboard with basic information:

The screenshot shows a 'Consumer' dashboard. At the top, there's a 'Consumer' title and a status indicator (OFF). Below that, a power icon is shown. The dashboard displays the following information:

- State: OFF
- Power: 0 W
- Temperature 1: 0.0 °C
- Temperature 2: 0.0 °C
- Humidity: 0 %
- Override: 0 min

Below this is the 'FOA service' section, which includes:

- FOA active: from: 3 : 0 to: 19 : 0
- Max duration: 30 min
- Max requests: 2
- Suspend time: 0 min
- FOA switch: ON
- Cyclic operation:
- Cycle duration: 30 min
- Finish time: 19 : 0

A 'START' button is located at the bottom of the FOA service section.

- Name
- Icon and button (used for manual switching by user)
- Operating state
- Consumption power
- Temperature related to this consumer (if sensor exists)
- Humidity related to this consumer (if sensor exists)
- Override time (time validity for manual switch)

Besides basic information there is extended set of parameters used to configure and provide general constraints for flexibility offering and operation triggered from trading service.

These parameters can be classified into two groups, as:

- General consumers
- Consumers with cyclic operation

These groups exclude each other which means if cyclic operation is chosen then general parameters are not used (and vice versa).

1. General consumer parameters

From and **To** parameters define a period of a day in which HEMS will offer that device. If parameter From is higher than To then HEMS will not offer that device between From and To but in any other times. See examples below.

Max duration of a flex offer parameter limits the length of a flex offer / demand schedule. Demand schedule cannot be longer than 225 minutes (15 time steps, one time step is 15 minutes long). **This parameter is not yet validated, will be implemented in next phase.**

Max requests per day parameter limits maximum number of demand schedules per day. Once this number is reached, no flex-offer is given for that device until next day – and consequently no demandSchedule for that device will be received/implemented. That parameter also enables/disables flex offering with setting the parameter value to 0.

Suspend time is minimum time after demand schedule execution for which the consumer will not be offered. That parameter takes into account home appliances, for which it is not expected to be switched off for longer time (eg. fridge). **This parameter is not yet validated, will be implemented in next phase.**

FOA switch is used to support device switching ON/OFF, ON only or OFF only. If **ON/OFF** selected, HEMS is allowed to offer device switching on or off. If **ON only**, HEMS is allowed to offer only device switching on. If **OFF only**, HEMS is allowed to offer only device switching off.

2. Cyclic operation parameters

These parameters refer to devices which operate by programmed cycles (washing machine, dishwasher, clothes dryer ...). **It is very important to check if device allows cycle interruption, these parameters are only for allowed interruption of device! In case cycle interruption is not allowed (e.g. washing program will reset) then this consumer cannot be offered to trading service and will be excluded from flex offers.**

Cyclic operation parameter defines a device as a cyclic device with allowed cycle interruption. If checked, then HEMS system will include this consumer to flex offers. In that case, the next two parameters have to be specified further. Other parameters for General consumers are not valid anymore.

Cycle duration parameter specifies the time in minutes, required to finish that cycle. If there are several programs with different duration it is recommended to set correct duration before each cycle. If end user doesn't have this information then it is acceptable to set maximum duration possible for that device, it will be used for all programs.

Finish time parameter specifies the time of a day, the device cycle should be finished.

START button basically stops the operation cycle immediately and starts flexibility offering of this device. After demand schedule is received device will execute the cycle completely without interruptions. If trading service doesn't send any demand schedule then operation cycle is executed automatically according to default schedule (please refer to Example 3).

Configuration examples

Example 1

FOA service

FOA active: from: 10 : 0
to: 15 : 0

Max duration: 0 min

Max requests: 2

Suspend time: 0 min

FOA switch: ON/OFF

Cyclic operation:

Cycle duration: 0 min

Finish time: 0 : 0

START

Device will be offered between 10:00 and 15:00 every day. When trading service sends demand schedule and it executes the second flexibility offering starts because **max requests** is set to 2. After executing second demand schedule no more flexibility offers for this device will be generated (even before 15:00), until next day.

Since device is not cyclic, **Cycle** operation checkbox is unchecked and following parameters are not used.

00:00					09:45	10:00	10:15	10:30	14:45	15:00	15:15					23:45
FLEX OFFER DISABLED						FLEX OFFER ENABLED										FLEX OFFER DISABLED					

Example 2

FOA service

FOA active: from: 15 : 0
to: 10 : 0

Max duration: 0 min

Max requests: 2

Suspend time: 0 min

FOA switch: ON/OFF

Cyclic operation:

Cycle duration: 0 min

Finish time: 0 : 0

START

Device will be offered any other time, except between 10:00 and 15:00 every day. Up to two demand schedules are executed per day.

00:00					09:45	10:00	10:15	10:30	14:45	15:00	15:15					23:45
FLEX OFFER ENABLED						FLEX OFFER DISABLED										FLEX OFFER ENABLED					

Example 3

FOA service ^

FOA active: from: :
to: :

Max duration: min

Max requests:

Suspend time: min

FOA switch:

Cyclic operation:

Cycle duration: min

Finish time: :

Cyclic device with program (cycle) duration of 2 hours (e.g. washing machine) will be offered once. User prepares laundry at 10:20 and requires that operation is finished lately by 16:00.

The following scenario is assumed:

1. User prepares the device for operation and starts the washing cycle at **10:20** (press play on washing machine).
2. User opens “My Things” web page, allocate appropriate device and enters the cycle duration (120 minutes) and cycle finish deadline parameter as 16:00 and pushes the **Start** button.
3. Start button is signal for HEMS that the device is prepared for operation. HEMS immediately stops the washing process (switches off power supply of the washing machine).
4. HEMS computes the default schedule start as:

$$\text{defaultScheduleStart} = 10:30$$

HEMS takes two parameters:

cycle duration = 120 minutes

cycle finish deadline = 16:00

HEMS checks the truth of the following statement:

$$\text{defaultScheduleStart} + 2 \times \text{cycle duration} + 15 < \text{cycle finish deadline}$$

If statement is **FALSE**, it doesn't offer the device, but switches it on and let it operate and finish the job. If statement is **TRUE**, HEMS prepares flex offer, where default schedule will start the device at the beginning of the next 15 min interval (that is 10:30) for the interval length of 120 minutes. Adaptation potential min represent the device operation between 10:30 and 12:30, adaptation potential max represent that the device will not operate.

Following are three options:

- a. FOA doesn't send *demand schedule*. HEMS implement default schedule for that device.
- b. FOA replies with *default schedule* accepted (adaptation potential min). HEMS implements default schedule for that device.
- c. FOA replies with *demand schedule* (adaptation potential max) – so it requests not to start the operation in next interval of 120 minutes.

Option a) and b) means that the device will finish the job as default schedule.

Option c) represents device operation shifting in time.

5. After 120 minutes - that is - at 12:30 item 4. repeats, with the following parameters:
defaultScheduleStart = 12:45
cycle duration = 120 minutes
cycle finish deadline = 16:00

Since the statement ***defaultScheduleStart + 2 x cycle duration + 15 < cycle finish deadline*** returns **FALSE**, HEMS switches on the device and let it finish the job.

00:00		09:45	10:00	10:15	10:30	...		12:30	...	14:45	15:00		16:00		23:45
				Start pressed, first offer send	Device switched on if FOA requests			Device switched on in any case					Cycle finish deadline		
					Statement = TRUE			Statement = FALSE							

Note: if the *cyclic finish deadline* is 18:00, then the statement returns **TRUE**. HEMS prepares new flex offer where default schedule will start the device at the beginning of the next 15 min interval (that is 12:45) for the interval length of 120 minutes. Adaptation potential min represent the device operation between 12:45 and 14:45, adaptation potential max represent that the device will not operate between 12:45 and 14:45.