Smart Home Standardization – Towards a common data model

Status
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My device
My area of responsibility
My performance

New Smart Home world – Smart Appliance as a member of this world

Main target of Smart Home & Smart Appliances: Interoperability

Interoperability means:
• Common functionalities manufacturer independent
• At least for main features
• Common agreement with all manufacturers
Smart Home Architecture EU mandate M490 Smart Grid

Interoperability includes lots of different layers

User Stories and Use Case process
User Stories – the promise to the customer.
(referenced to TR 62746-2 Use Cases and Requirements)

**User wants to know when the washing machine has finished working.**
User wants to dim all lighting.
User wants his electrical car charged by 3:00h p.m., ready to use.

**User wants his washing done by 5:00h p.m. with least electrical power costs.**
User wants his electrical car charged by 3:00h p.m., ready to use.

**User wants to get remote help if the washing machine works improperly.**
User allows the Customer Energy Manager to reduce the energy consumption of his freezer in a defined range for a specific time, if the grid recognizes (severe) stability issues.

**User wants to consume the electrical power produced by his own.**
User wants to feed PV energy into own battery pack if too much power is available.

**User wants to limit own energy consumption up to a defined limit.**
User wants to limit own energy consumption up to a defined limit.
User likes to limit own energy consumption up to a defined limit.

**User wants to know when the washing machine has finished working.**
User wants to sell own decentralized energy (e.g. PV) to Smart Grid.

**Grid related emergency situations (blackout prevention)**
User wants to sell own decentralized energy (e.g. PV) to Smart Grid.

**User Stories (e.g. flexible start of Smart Appliance)**

The user likes to get the laundry ready until 8:00pm.
The user prepares the washing machine
- Fills clothes.
- Selects washing program
- Pre-selects the end-time (e.g. 8:00pm)
- May pre-select the incentive program (e.g. cheapest tariff, greenest power etc.)
- Starts washing program

User wants to wash washing machine until 8:00pm.
The washing machine informs the CEM about
- The start of the new program
- The pre-selected end-time
- The pre-selected incentive program (if not already stored)
- The expected energy consumption profile with duration and (e.g. time related specific) power consumption.

The CEM calculates the operation plan and takes into account
- The selected incentive program e.g. Tariff information
- PV forecast
- Expected energy consumption from other Smart Devices
- Expected energy consumption of the requesting Smart Device

The CEM sends the calculated start time to the Smart Device
- The Smart Device starts the cycle
- Based on the calculated start time
- Based on an updated start time

**How to describe requested energy (as an example of several requirements)**

<table>
<thead>
<tr>
<th>Power profile</th>
<th>Power profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence 1</td>
<td>Sequence 2</td>
</tr>
<tr>
<td>Demand</td>
<td>Demand</td>
</tr>
<tr>
<td>Energy</td>
<td>Energy</td>
</tr>
<tr>
<td>Resource</td>
<td>Resource</td>
</tr>
<tr>
<td>Duration</td>
<td>Duration</td>
</tr>
<tr>
<td>Latest start</td>
<td>Latest start</td>
</tr>
<tr>
<td>earliest start</td>
<td>earliest start</td>
</tr>
<tr>
<td>relative of absolute</td>
<td>relative of absolute</td>
</tr>
</tbody>
</table>

**Example:**
- Energy profile: 
  - Resource: Electricity
  - Duration: 15 minutes
  - Demand: 500W
- Energy profile: 
  - Resource: Gas
  - Duration: 10 minutes
  - Demand: 100W

**Data Model requirements**

- Flex start: Enables Demand Response / Demand Side Management
  - Electricity: PV, CHP, green, cheap, ...
  - Water
  - Gas
  - Example: Flex start <Electricity, PV>
- Time info: Information about timing etc.
  - Duration of cycle (complete or remaining)
  - Earliest start time (relative of absolute)
  - Latest start time (relative of absolute)
  - Example: time info <duration = 2h, est = 0min rel., lst = 7h rel.>
- Energy profile: Information about energy demand and timing etc.
  - Resource: Electricity, Water, Gas, ...
  - Duration of specific cycle
  - Demand of energy (min, avg, max)
  - Example: energy profile <Electricity, duration = 50min, demand = 500W, avg = 300W, 50min = 150W>

**User Stories**

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Actual Status of activities

Excerpt of relevant Standardization bodies

Excerpt of relevant documents

Who is in charge of: scenario INHOME
Who is in charge of: scenario Cloud solutions

- Google NEST
- Google Thread
- Proprietary solutions
- TCP/IP, Eth, WiFi/WLAN
- EEBus (EEBus Initiative)
- Energy@Home
- Proprietary solutions

How to ensure Interoperability if lot’s of different consortia are developing own solutions?

- Open Interconnect Consortium (OIC)
- Thread Group
- Apple
- Red Elephant
- Qivicon
- Samsung smart home
- ARM
- Ericsson
- Vodafone

Backup

Intention to achieve an overall EU-wide connectivity approach!

Together with the European Commission (DG-Connect and DG-Energy)

- Alignment of Data Models
- Common support of International Standards

Map of Europe showing significant players.