Ambient Intelligence

The DomoBus
System Specification Language
- An Example

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General Structure
of the XML file

```
<DomoBusSystem ID="#" Name="x" Version="#.#" Date="x">
    . . . Value types (they allow definition of Properties). . .
    . . . Device types . . .
    . . . Users  and  Access levels . . .
    . . . House structure . . .
    . . . Services . . .
    . . . Devices . . .

    and other additional relevant data…
    . . . Scenarios . . .
    . . . Favorites (most used devices, etc) . . .

    . . . System state . . . (for simulation)
    . . . System behavior . . . (in the future…)
. . .
</DomoBusSystem>
```

Note:
"#" – Represents a number
"x" – Represents a string

System Identification

<DomoBusSystem ID="**123**" Name="**Example System**" Version="**1.0**" Date="**29-03-2016**">
. . .
</DomoBusSystem>

House Structure

<House ID="**98**" Name="**Nunes Home**" Address="**No name street, 1**" Phone="**123456789**">
  <FloorList>
    <Floor ID="**1**" Name="**Ground floor**" HeightOrder="**0**" />
    <Floor ID="**2**" Name="**First floor**" HeightOrder="**1**" />
    <Floor ID="**3**" Name="**Attic**" HeightOrder="**2**" />
  </FloorList>
  <DivisionList>
      <Division ID="**1**" Name="**Kitchen**" RefFloor="**1**" />
      <Division ID="**2**" Name="**Living room**" RefFloor="**1**" />
      <Division ID="**3**" Name="**Bedroom**" RefFloor="**2**" />
      <Division ID="**4**" Name="**Store room**" RefFloor="**3**" />
  </DivisionList>
</House>

Device Types
(example of requirements)

- The system requires 3 device types:
  – Temperature sensors
  – Regulated light
  – Electrical toaster

- Temperature sensors have just one property:
  – Temperature (valid values: 0 – 40 ºC) (variation: 1ºC)

- Regulated lights have two properties:
  – State (on=1 / off=0)
  – Intensity (0 – 100 %) (variation: 10)

- Electrical toasters have two properties:
  – Mode (off=0 / toasting=1 / warm=2)
  – Duration (1 – 10) (variation: 1)

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Value Types

```
<ScalarValueTypeList>                    <!-- NumBits: 8 or 16 -->
 <ScalarValueType ID="1" Name="Temperature" NumBits="8" Units="ºC" MinValue="0" MaxValue="40" Step="1" />
 <ScalarValueType ID="2" Name="Intensity" NumBits="8" Units="%" MinValue="0" MaxValue="100" Step="10" />
 <ScalarValueType ID="3" Name="Duration" NumBits="8" Units="-" MinValue="1" MaxValue="10" Step="1" />
</ScalarValueTypeList>

<EnumValueTypeList>
 <EnumValueType ID="1" Name="State">
     <Enumerated Name="off" Value="0" />
     <Enumerated Name="on" Value="1" />
 </EnumValueType>
 <EnumValueType ID="2" Name="Mode">
     <Enumerated Name="off" Value="0" />
     <Enumerated Name="toasting" Value="1" />
     <Enumerated Name="warm" Value="2" />
 </EnumValueType>
</EnumValueTypeList>

<ArrayValueTypeList>
</ArrayValueTypeList>
```

Temperature sensors have one property:
- Temperature (valid values: 0 – 40 ºC) (variation: 1ºC)

Regulated lights have two properties:
- State (on=1 / off=0)
- Intensity (0 – 100 %) (variation: 10)

Electrical toasters have two properties:
- Mode (off=0 / toasting=1 / warm=2)
- Duration (1 – 10) (variation: 1)

Note:
8 bit value: 0 to 255   or   -128 to 127
16 bit value: 0 to 65535   or   -32768 to 32767

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Device Types

```
<DeviceTypeList>
  <DeviceType ID="1" Name="Temperature sensor" Description=" - ">
      <PropertyList>                                    <!-- Value types: "SCALAR", "ENUM" or "ARRAY" -->
        <Property ID="1" Name="Temperature" AccessMode="RO" ValueType="SCALAR" RefValueType="1" />
      </PropertyList>
  </DeviceType>
  <DeviceType ID="2" Name="Regulated light" Description=" - ">
      <PropertyList>
        <Property ID="1" Name="State" AccessMode="RW" ValueType="ENUM" RefValueType="1" />
        <Property ID="2" Name="Intensity" AccessMode="RW" ValueType="SCALAR" RefValueType="2" />
      </PropertyList>
  </DeviceType>
  <DeviceType ID="3" Name="Electrical toaster" Description=" - ">
      <PropertyList>
        <Property ID="1" Name="Mode" AccessMode="RW" ValueType="ENUM" RefValueType="2" />
        <Property ID="2" Name="Duration" AccessMode="RW" ValueType="SCALAR" RefValueType="3" />
      </PropertyList>
  </DeviceType>
</DeviceTypeList>
```

Devices
(example of requirements)

- The system requires:

  - 2x Temperature sensors:
    - *Kitchen-Temp*, located in the Kitchen (has address 10)
    - *LivingRoom-Temp*, located in the Living room (has address 15)

  - 3x Regulated light:
    - *Kitchen-Light*, located in the Kitchen (has address 20)
    - *LivingRoom-Light*, located in the Living room (has address 25)
    - *Bedroom-Light*, located in the Bedroom (has address 30)

  - 1x Electrical Toaster:
    - *Kitchen-Toaster*, located in the Kitchen (has address 40)

Devices

```xml
<DeviceList>
 <Device ID="1" RefDeviceType="1" Name="Kitchen-Temp" Address="10" RefDivision="1" />
 <Device ID="2" RefDeviceType="1" Name="LivingRoom-Temp" Address="15" RefDivision="2" />
 <Device ID="3" RefDeviceType="2" Name="Kitchen-Light" Address="20" RefDivision="1" />
 <Device ID="4" RefDeviceType="2" Name="LivingRoom-Light" Address="25" RefDivision="2" />
 <Device ID="5" RefDeviceType="2" Name="Bedroom-Light" Address="30" RefDivision="3" />
 <Device ID="6" RefDeviceType="3" Name="Kitchen-Toaster" Address="40" RefDivision="1" />
</DeviceList>

                          <DeviceTypeList>
                             <DeviceType ID="1" Name="Temperature sensor" Description=" - ">
                             <DeviceType ID="2" Name="Regulated light" Description=" - ">
                             <DeviceType ID="3" Name="Electrical toaster" Description=" - ">
                          </DeviceTypeList>

                          <DivisionList>
                             <Division ID="1" Name="Kitchen" RefFloor="1" />
                             <Division ID="2" Name="Living room" RefFloor="1" />
                             <Division ID="3" Name="Bedroom" RefFloor="2" />
                             <Division ID="4" Name="Store room" RefFloor="3" />
                          </DivisionList>
```

Users and Access-Levels

```xml
<AccessLevelList>
    <AccessLevel Level="0" Name="Guest" />
    <AccessLevel Level="3" Name="Children" />
    <AccessLevel Level="6" Name="Parents" />
    <AccessLevel Level="9" Name="Admin" />
</AccessLevelList>


<UserList>
    <User ID="1" Name="John" Password="1234" AccessLevel="9" />
    <User ID="2" Name="Mary" Password="4321" AccessLevel="6" />
</UserList>
```

```
<ServiceList>
    <Service ID="1" Name="Lighting" />
    <Service ID="2" Name="Temperature" />
    <Service ID="3" Name="Security" />
    <Service ID="4" Name="Entertainment" />
</ServiceList>


        <DeviceList>
         . . .
         <Device ID="3" RefDeviceType="2" Name=" Kitchen-Light" Address="20" RefDivision="1">
          <DeviceServiceList>
            <DeviceService RefService="1" />
            <DeviceService RefService="3" />
          </DeviceServiceList>
         </Device>
         . . .
        </DeviceList>
```

Scenarios

```
<ScenarioList>
  <Scenario ID="1" Name="All Lights Off">
    <ActionList>
      <Action ID="1" RefDevice="3" RefProperty="1" Value="0" />
      <Action ID="2" RefDevice="4" RefProperty="1" Value="0" />
      <Action ID="3" RefDevice="5" RefProperty="1" Value="0" />
    </ActionList>
  </Scenario>
</ScenarioList>
```

Favorites

```
<Favorites>
    <FavoriteList RefUser="2">
            <FavoriteDevice ID="1" RefDevice="3" />
            <FavoriteDevice ID="2" RefDevice="6" />
    </FavoriteList>
</Favorites>
```

Questions?