Universal Middleware Bridge for Product Interoperability (related with 18012-1 & 2)

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Overview of Proposal

- Interoperability Issues prevent companies from concentrating on investing home network technology and home network solutions to be widely used.

- Interoperability
  - The ability of two or more entities to communicate and co-operate, despite differences in the implementation language, the executing environment and/or the model abstraction.

- 18012
  - Describe the interaction between products in a multi-system installation.
  - Interoperability Framework & Application Level Interoperability.
  - The best solution under the current and future home network environment.

- ETRI introduces Universal Middleware Bridge (UMB) that has similar concepts with 18012 and proposes our system to make a detail specification for an HES Interoperability.
Position of the Proposal

- HES Interoperability Framework

Documents of ISO/IEC JTC 1 SC 25 WG 1

Inside the home

- HES Interoperability Framework
- ISO/IEC 15045
- ISO/IEC 24767
- HES Interoperability Framework
- ISO/IEC 18-12-1, 2, 3-n

- Application Models
  - Audio / Video
  - Voice
  - Data
  - White Goods
  - White Goods

Home Network Security ISO/IEC 24767

- Security
- Adaptation Profile
- Layer 7
- Layers 4-6
- Layer 3
- Layer 2
- Layer 1
- Generic Cabling
- Other media

ISO/IEC 15018

Outside the home

- Documents of ISO/IEC JTC 1 SC 25 WG 1

Outside of SC 25 scope
UMB for Product Interoperability

- Interoperable Scope of UMB
- UMB Overview
- Application Level Interoperability Model
- UMB protocols
- VDT schemas
- Interoperable Service Model
- Comparing UMB with SC25 WG1
Through doing message translations, UMB supports product interoperability in heterogeneous middleware environment.
Overview of UMB

- **Purpose**
  - solves Interoperability issues between devices that support a heterogeneous home network middleware

- **Architecture**
  - Virtual Device Type (VDT)
  - Middleware Adaptor
    - Local Network Management
    - Translation of Device Function and Message
    - Virtual Device Object (VDO)
  - UMB Core
    - Connection Management
    - Communication Channel
    - Message Routing
  - UMB Protocols

- **Concepts**
  - 1-to-N Mapping/Translation way between UMB Core and Adaptors
  - Support Distributed Environments
Application Level Interoperability Model

Interworking Function

- Device Type Translation
- Message Translation

Middleware A Adaptor

Middleware A

Device = Lamp
Semantic
Value
On 0
Off 1

Lamp ⇔ Light
0 ⇔ 0
1 ⇔ 1

Middleware B Adaptor

Middleware B

Device = Light
Semantic
Value
On A
Off B

Light ⇔ Light
A ⇔ 0
B ⇔ 1

Middleware C Adaptor

Middleware C

Device = Illum
Semantic
Value
On ON
Off OFF

Virtual Device Type

- Device Type Definition
- Function Definition
- Action Definition
- Event Definition

UMB (UMB-Core)

Device = Light
Semantic
Value
On 0
Off 1

Light ⇔ Illum
0 ⇔ ON
1 ⇔ OFF

Device Type Translation
Message Translation
Interworking Function
- Device Type Definition
- Function Definition
- Action Definition
- Event Definition

Virtual Device Type

Device Type Translation
Message Translation
UMB Protocols

- Definition
  - Protocol between UMB-Core and Adaptors

- Scenarios
  - Adaptor Plug-in/out
  - Device Plug-in/out
  - Device Control/Monitoring
  - Event Handling

- Communication Types
  - One-to-One
  - One-to-Many
  - Broadcast
VDT Schemas

Device Specification  (Device, Function, Action, Event)

Example of Function

PowerSwitch

Action ID  in- parameter  out- parameter
SetPowerControl  powerStatus
GetPowerStatus  powerStatus

Event ID  PowerStatus

Virtual Device Type

• Definition
  • Common Device Function Specification

• Structure
  • Device Type
  • Device is Collection of Functions
  • Function consists of Actions and Events

• Meaning
  • Device Type Translation
  • Semantic Message Translation

• VDT Structure
  • XML Schemas

VDT is similar to HES Application Interoperability Taxonomy

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Interoperable Service Model

Energy Saving Service (1001)
Main Service Logic

Device Binding Table

<table>
<thead>
<tr>
<th>Obj#</th>
<th>out action</th>
<th>Obj#</th>
<th>in action</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>TempSensor. currentLevel</td>
<td>0</td>
<td>EnergyMngt. currentLevel</td>
</tr>
<tr>
<td>3</td>
<td>TempSensor. currentLevel</td>
<td>1</td>
<td>Boiler. setCurrentLevel</td>
</tr>
<tr>
<td>0</td>
<td>EM. setCurrentLevel</td>
<td>2</td>
<td>AC. setCurrentLevel</td>
</tr>
</tbody>
</table>

Service Adaptor

DBT is similar to Binding Map & Event Bus
## Comparing UMB with SC25 WG1

<table>
<thead>
<tr>
<th></th>
<th>18012</th>
<th>UMB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Architecture</strong></td>
<td>RG centric Messaging among Half-Gateway</td>
<td>Messaging among Adaptors</td>
</tr>
</tbody>
</table>
| **Common Interoperability System (CIS)** | - Abstract Intermediate Language (AIL)  
- Intermediate protocol (RGIP)  
- Intermediate bus (RGIB) | - UMB Core and Adaptors  
- UMB Protocols                          |
| **Message Translation** | - Half-Gateway (GIWF)  
- Interworking Function (IWF) | - Adaptor’s Translation Function          |
| **Interaction Model** | - Application Bind Map  
- Application Domain | - Device Binding Table  
- Interoperable Service Model          |
| **Device Profile**   | - HES Application Interoperability Taxonomy  
- Functional Object | - Virtual Device Type  
- Virtual Device Object               |
Testbed of UMB

LnCP AirConditioner

UPnP SPY

TCP/IP

UPnP Adaptor

LnCP Adaptor

UMB-C

Service Adaptor

LonWorks Adaptor

ZigBee Adaptor

ZigBee Lamp

PLC

ZigBee

WebPad

LonWorks

Testbed of UMB
Field Service of UMB

- Jamsil Apartment Complex (Seoul)
  - 1 RG, ZigBee, UPnP SPY
  - ZigBee/UPnP Adaptor
  - Housing Complex Server Solution

- Sanggye Apartment Complex (Seoul)
  - 1 RG, RF, Z256, UPnP SPY
  - Z256, RF, UPnP Adaptor
  - Housing Complex Server Solution
Conclusion

- ETRI has developed UMB as Interoperable Framework for solving Home Network Interoperability Issues

- Universal Middleware Bridge (UMB)
  - Application Level Interoperability Framework
  - UMB Core and Adaptors
  - UMB protocols
  - VDT schemas
  - Interoperable Service Model

- It is needed detail specifications for Home Network Interoperability
- The Interoperability Framework based on UMB concepts can be regarded as the suitable model for specifying 18012
- We propose UMB technology as NWIP if the scope of the proposal falls into that of SC25 WG1
Thank You!

Questions?
Comments?

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