



**Publicly Available Specification (PAS);
Smart Machine-to-Machine communications (SmartM2M)
Home Gateway Initiative
RD048-HG Requirements For HGI Open Platform 2.1**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Smart Machine-to-Machine communications (SmartM2M), as result of the PAS process for document HGI-RD048 developed by the Home Gateway Initiative.

The Home Gateway Initiative, a non-profit organization closed on June 2016, produced guidelines, requirements documents, white papers, vision papers, test plans and other documents concerning broadband equipment and services which are deployed in the home.

HGI worked on Specifications for home connectivity and Services enablement, in particular to encompass a delivery framework for Smart Home services. The defined architecture includes support for a standard, general purpose software execution environment in the HG (for third party applications), API definitions, device abstraction, and interfacing with Cloud based platforms.

The HGI's methodology ensured that projects undertaken reflected items of strong interest to the Broadband Service Providers (BSPs), as well as brought in opportunities at every stage for vendor input, suggestions and participation.

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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

1 Scope and purpose of the present document

1.1 Abstract

The present document, originally developed as HGI-RD048v2, contains requirements regarding modular software deployments on the home gateway. These requirements form the HGI's "Open Platform 2.1".

Under the Open Platform 2.1 requirements, modular software applications have to run in a dedicated virtual execution environment to avoid conflicts and interferences with the natively installed software. The present document reflects generic requirements valid for any modular execution platform, as well as technology-specific requirements for OSGi technology. Other technology-specific requirements could be developed in the same way as the OSGi requirements, in conjunction with the generic requirements.

The present document, HGI_RD048v2, is an update of, and supersedes, HGI's already-published HGI-RD48v1 which specified the requirements for Open Platform 2.0. HGI-RD048v2 specifies Open Platform 2.1 that primarily updates external references and makes various corrections.

HGI-RD48v1 itself was an updated version of HGI-RD008 [i.20], HG Requirements for a Software Execution Environment, which was known in the HGI community as "SWEX". Besides updates on referred standards, HGI-RD048v1 added basic requirements to support USB based hardware extendibility for Smart Home services, details for usage for OSGi technology and system clock management.

1.2 Scope and purposes

Service delivery to residential customers beyond triple play requires the integration of home devices and appliances with cloud infrastructures. Such integration often requires new software in the home network, but the variety of available technologies makes this difficult. In order to achieve the next level of service integration, there is a need for software flexibility on the main operator-controlled device in the home, the home gateway.

New software can be added to the HG by doing complete firmware upgrades; however doing this may cause significant problems. Each new version need to be fully tested, and different versions are required for different application areas. Maintaining different versions of firmware for several HG models would further complicate configuration management. There is also the considerable overhead of upgrading large numbers of HGs.

The solution discussed in the present document integrates a software execution platform, called by HGI Open Platform 2.1, into the firmware, allowing the installing, updating, uninstalling, starting and stopping of additional software modules, while the underlying firmware image remains untouched.

The present document contains a home gateway software modularity architecture specification based on function blocks, a role and entity model, and derives requirements for the home gateway. Requirements are specified not only for a software execution platform, but also for an API that allows software modules to access the core home gateway functions.

The requirements section is divided into two areas: generic requirements, which apply to any technology used as software execution platform, and specific requirements for selected technologies. Specific requirements are only given for OSGi technology in the present document.

1.3 What is new compared to HGI-RD008 and to RD-048v1?

1.3.1 RD-048v1 compared with RD-008 [i.20]

- Addition of Smarthome related low-level requirements, especially in terms of support of USB based hardware extendibility.
- Detailed requirements for system clock synchronization.
- Detailed OSGi requirements: Many requirements have been detailed for clarification and precision reasons.
- Reference to Broadband Forum TR-181 [i.4] rather than the outdated TR-098 [i.5].

- Reference to OSGi R4 version 4.2 ([i.9] and [i.10]) and higher rather than 4.0 and higher.
- Collation of Java™ related requirements into HGI/Minimum-1.0 Java™ Profile.

1.3.2 RD-048v2 compared with RD-048v1

- Streamlined text.
- Modified figures to reflect text consistency.
- Streamlined wording of requirements.
- Updated references to OSGi and Java™ JRE version.
- Updated Java™ related requirements to Java™ 8 compact1 profile.
- Requirements that in RD-048v1 referred to OSGi Service Platform Specification Release 4.2 (Core [i.9] and Compendium [i.10]) now refer to Release 4.3 (Core [i.11], and Residential [i.12]), 5 (Core [i.13]) and 6 (Core [i.14], and Residential [i.15]).
- Re-inserted references to TR-098 [i.5] along with TR-181 [i.4] since TR-098 continues to be deployed.

1.4 Relationship with HGI residential profile

The present document contains requirements over and above those in the HGI Residential Profile [i.1], to support the software module execution environment. All requirements of the HGI Residential Profile still apply.

Some of the original functionalities defined in the HGI Residential Profile [i.1] may be suitable for implementation as software modules, in particular those that have some of the following characteristics:

- Control functions (rather than data plane).
- Functions which can be run on different HG models.
- Functions with different versions.

The following list gives examples of functionalities from the HGI Residential Profile, which may be amenable to implementation as software modules (see definitions in [i.1]):

DHCP Server - A DHCP server is a fairly standalone application, handing out local IP addresses and managing their lifetime. The information gathered by the DHCP server can easily be given to other (authorized) modules (MAC addresses, DHCP options).

UPnP IGD - A UPnP IGD [i.2] service for example would be easy to implement on top of an OSGi service platform, because OSGi provides a standardized UPnP stack [i.2], given that there is an interface to manage the lower level functions of the HG.

Local Management Remote User Interface - An operator might see some advantage in having the same implementation of the LM Remote UI for different models of HGs, to facilitate a consistent corporate design, and having only one code base to maintain.

DynDNS Client - A DynDNS client is also a fairly stand-alone application (registering a public IP address at a certain domain server). Having it as a module has the advantage that several registration protocols for different dynamic DNS services can be supported.

NTP Client - Needs access to system date and time management of the HG.

However, some functions defined in the HGI Residential Profile are not recommended to be done as modules. These include the networking features (e.g. routing, bridging, NAT), the basic HG remote management and the firmware upgrade from the RMS (Remote Management System). The common feature of these is that these functions are normally preserved in the case of an execution environment fault. Further, these functions are generally already available in native software, and gain a performance advantage from direct interaction with the hardware.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] HGI-RD001-R2.01: "Home Gateway Technical Requirements: Residential Profile V1.01".

[i.2] UPnP IGD 2.0: "Internet Gateway Device (IGD) v2.0".

NOTE: See <http://upnp.org/specs/gw/igd2/>.

[i.3] ETSI TS 103 424: "Publicly Available Specification (PAS); Smart Machine-to-Machine communications (SmartM2M) Home Gateway Initiative RD036-Smart Home architecture and system requirements".

[i.4] BBF TR-181: "Device Data Model for TR-069".

NOTE: See <https://www.broadband-forum.org/technical/trlist.php?key=1>.

At the time of writing two *issues* of TR-181 are available. *Issues* in BBF terminology stand for non-backward-compatible updates, so in fact TR-181i1 and TR-181i2 describe independent data models and requirements are intended to specify compliance at least with one *issue*. *Amendments* indicate backward compatible changes (except for DEPRECATED and OBSOLETE features) so it would be enough to check compliance with the most recent *Amendment* for each issue. *Corrigenda* indicate minor revisions.

[i.5] BBF TR-098: "Internet Gateway Device Data Model for TR-069".

NOTE: See <https://www.broadband-forum.org/technical/trlist.php?key=1>.

[i.6] BBF TR-069 Amendment 5: "CPE WAN Management Protocol".

NOTE: See <https://www.broadband-forum.org/technical/trlist.php?key=1>.

- [i.7] BBF TR-104: "DSLHome Provisioning Parameters for VoIP CPE".
- NOTE: See <https://www.broadband-forum.org/technical/trlist.php?key=1>.
At the time of writing two *issues* of TR-104 are available. *Issues* in BBF terminology stand for non-backward-compatible updates, so in fact TR-104i1 and TR-104i2 describe independent data models and requirements are intended to specify compliance at least with one *issue*. *Amendments* indicate backward compatible changes (except for DEPRECATED and OBSOLETE features) so it would be enough to check compliance with the most recent *Amendment* for each issue. *Corrigenda* indicate minor revisions.
- [i.8] BBF TR-157 Amendment 10: "Component Objects for CWMP".
- NOTE: See <https://www.broadband-forum.org/technical/trlist.php?key=1>.
- [i.9] "OSGi Service Platform Core Specification Release 4.2".
- NOTE: See <https://osgi.org/download/r4v42/r4.core.pdf>.
- [i.10] "OSGi Service Platform Compendium Specification Release 4.2".
- NOTE: See <https://osgi.org/download/r4v42/r4.cmpn.pdf>.
- [i.11] "OSGi Service Platform Core Specification Release 4.3".
- NOTE: See <https://osgi.org/download/r4v43/osgi.core-4.3.0.pdf>.
- [i.12] "OSGi Service Platform Residential Specification Release 4.3".
- NOTE: See <https://osgi.org/download/r4v43/osgi.residential-4.3.0.pdf>.
- [i.13] "OSGi Service Platform Core Specification Release 5".
- NOTE: See <https://osgi.org/download/r5/osgi.core-5.0.0.pdf>.
- [i.14] "OSGi Service Platform Core Specification Release 6".
- NOTE: See <https://osgi.org/download/r6/osgi.core-6.0.0.pdf>.
- [i.15] "OSGi Service Platform Residential Specification Release 6".
- NOTE: See <https://osgi.org/download/r6/osgi.residential-6.0.0.pdf>.
- [i.16] "Java 8 For Embedded, compact1 profile".
- NOTE: See <https://docs.oracle.com/javase/8/docs/technotes/guides/compactprofiles/compactprofiles.html>.
- [i.17] JSR 80: "Java™ USB API".
- NOTE: See <https://jcp.org/ja/jsr/detail?id=80>.
- [i.18] JSR 180: "SIP API for J2ME™".
- NOTE: See <https://jcp.org/ja/jsr/detail?id=180>.
- [i.19] "Java SE Embedded 8 vs. Java ME CDC Comparison".
- NOTE: See <http://www.oracle.com/technetwork/java/embedded/resources/tech/java-se-emb-vs-java-me-cdc-2157146.html>.
- [i.20] HGI-RD008: " Requirements for Software Modularity on the Home Gateway".
- NOTE: See <http://www.homegatewayinitiative.org/userfiles/file/downloads/RD-008-R3.pdf>.