

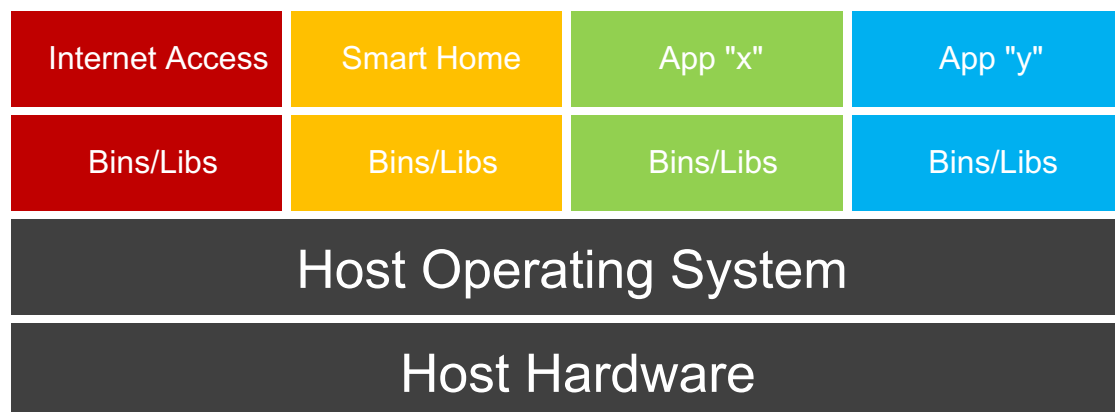
Requirements for Mobile IoT Routers and Net IoT Cubes "5G NR OR 4G LTE Cat.6 upwards" in combination with Smart Home Clients and other 3rd party Apps

Introduction

This document is the requirement specification for a hosting device to run a Smart Home Gateway Client, and other 3rd party apps, in a Container (SH namespace) as virtual environment on it. The Smart Home Client is a part of the Smart Home platform powered by Viva. More clients and agents will follow step by step.

The hosting hardware (e.g. mobile IoT router / net IoT cube) is sold to consumers in the EU/CEE markets. All applicable standards must comply with EU requirements and countries such as Scandinavia, North Macedonia, Serbia, Belarus, etc. Only for indoor use.

To be able to work close to the kernel, but still run 3rd party apps in a completely isolated environment and ensure high portability and security, containers must be used.



OS Level Virtualisation

The document was primarily compiled as a binding supplement for tender procedures. Nevertheless, any industry participant who becomes aware of this document is invited to submit an own initiative offer or to have it submitted by one of its partners.

Revision History

Date	Revision	Description
2019-09-24	Rev 1.0	Initial Version of the Requirement Document
2019-10-08	Rev 1.1	Inclusion of 5G and 4G and unification
2019-10-09	Rev 1.11	Error correction of the reference values

Responsibility

The persons listed below were involved in the preparation of the document and are therefore responsible for the contributions made and can be contacted at any time with questions concerning the content in question.

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Requirement types

Status	Description
MUST	Mandatory requirement.
SHOULD	Requirement which should be met, but which is not absolute.
CAN	Optional requirement which will strengthen the offering.

Note: Please keep in mind that the current SHOULD & CAN requirements may already become MUST in the course of the next tender. For fast-moving consumer goods, up to 2 tenders per year are not unusual.

Minimal functionality requirements on the hosting device and on/by the Smart Home Container

Core requirements

ID	Status	Description
G1	MUST	Linux platform. ARM or MIPS SoC families supported by OpenWrt Project (https://openwrt.org).
G2	MUST	Firmware image based on latest stable version of OpenWrt Linux distribution (or OpenWrt embedded in frameworks like prpl) image with LXC enabled, templates and configured namespaces with root accounts. <i>Note: The current stable version series of OpenWrt is 18.06, with v18.06.4 being the latest service release of the series, released on July 1st 2019.</i>
G3	MUST	At least two usable SH namespace processor cores from the CPUs of the host device with sufficient performance. ** <i>For comparison: On a gateway with MIPS Single-Core 880 MHz CPU (MT7621S), the utilization by the overall system, i.e. SH application incl. OpenWrt 14.07, etc., is about 30% on average.</i>
G4	MUST	Sufficient free flash memory for the SH namespace. <i>For comparison: On a gateway with 256MB flash memory, the consumption by the overall system, i.e. SH application incl. OpenWrt 14.07, libs/bins, etc., is currently around 80MB. Temporary logs and recordings are not included.</i>
G5	MUST	Sufficient free RAM for the SH namespace. <i>For comparison: On a gateway with 512MB RAM, the consumption by the overall system, i.e. SH application incl. OpenWrt 14.07, libs/bins, etc., is currently around 208MB.</i>
G6	MUST	RF-protocol support for: <ul style="list-style-type: none"> - Z-Wave Plus EU (700 series chips PREFERRED, may be 500 series chip EXCEPT ZM5304 module) - ZigBee 3.0 <i>Note: Can be, although not preferred, a secured external pluggable transceiver module, but must be an integral part of the overall offer.</i>
G7	MUST	2 x SSID Wi-Fi 2.4 GHz + 5 GHz (IEEE 802.11b/g/n and 802.11a/n/ac), but SHOULD be more, while 1 x SSID is exclusive managed by the SH namespace.
G8	MUST	5G NR OR 4G LTE Cat.6 (upwards and 3G fallback) with EU bands.
G9	MUST	Ethernet port(s) automatically switch between LAN and WAN mode.
G10	MUST	Wi-Fi SSIDs configurable in Client Mode or Access point Mode.
G11	MUST	Z-Wave Security 2 (S2) framework and Z-Wave SmartStart.
G12	MUST	MultipathTCP support for SH namespace VPN, via virtual networking device, to an endpoint in a faster network or Smart Home Cloud backend.
G13	MUST	Upgrade to newer or later versions of OpenWrt , including 19.07, within a maximum of 6 months.
G14	MUST	The initial board support package must be available at Mainline OpenWrt prior to shipment to the end customer.

Support for operation and quality of service

ID	Status	Description
Q1	MUST	Perform continuous firmware maintenance (OS, PKG, etc.) and controlled remote updates on new deliveries and in the installed base.
Q2	MUST	Service procedures for providing or implementing new namespaces, changing the configuration of existing namespaces, and loading or removing associated third-party services.
Q3	MUST	System Status Info Page with History about each SH namespace in Router's responsive Web UI, containing min. CPU Load and memory utilization (RAM/Flash).
Q4	MUST	Reliable WAN failover/failback handling in less than 5 seconds (failover/failback must be used in case MultipathTCP is not in use or not working).
Q5	MUST	Reliable and automatic connection re-establishment after a mobile network failure.
Q6	MUST	Globally functioning and automatic logon to the mobile network of an operator (MNO) or virtual operator (MVNO), access parameters derived directly from the inserted SIM card, immediately after switching on.
Q7	MUST	Fully configured watchdog functionality for important processes/containers on the device, i.e. detect failure of such a component and trigger defined actions.
Q8	MUST	The hardware and the operating system including its libraries and drivers must not limit the performance of any of the required RF technologies according to their specification at any time.
Q9	MUST	The power-on time of the device, application case #1, i.e. to put the device into an interactive, usable state, must be less than 60s.
Q10	MUST	Any software MUST support IPv4 and SHOULD support IPv6 and be able to communicate over both types of networks.
Q11	MUST	Timely interaction and exchange of bug fixes to and from specific OpenWrt software and features with the project.
Q12	MUST	Correction of critical security problems within 2 weeks as firmware updates.
Q13	MUST	Support signed updates to ensure system integrity.
Q14	SHOULD	Use of instances on preferred cloud platforms for the cloud functionalities required by the manufacturer as part of the implementation for production operations. Depending on the requirements or suitability, these are e.g. Exoscale (https://www.exoscale.com/) or Cumulocity IoT (https://cumulocity.com).
Q15	SHOULD	Support for remote management via TR-069 and associated additional TRs. Source code and samples for custom parameter provisioning provided.

Hardware and related requirements

ID	Status	Description
H1	MUST	Attractive and living-room suitable device design.
H2	MUST	Min 1 x Gigabit Ethernet, but SHOULD be more.
H3	MUST	Min 1 x USB 2.0 port, but SHOULD be higher version.
H4	MUST	Status LEDs.
H5	MUST	WPS button.
H6	MUST	Physical Reset button.
H7	MUST	EU Power supply.
H8	MUST	Operating Temperature range -10 to 55 °C.
H9	MUST	Storage Temperature range -10 to 55 °C.
H10	MUST	Battery backup. Min. 2 hours of full functionality with monitoring of battery status and battery life cycle including virtual API. DIY battery replacement.
H11	MUST	Compliance with requirements of latest version Z/IP Gateway SDK.*
H12	MUST	Compliance with requirements of latest version ZigBee SDK.*
H13	MUST / SHOULD	Wi-Fi SoC with exposed channel state information (CSI). MUST if ZigBee/Zwave hardware support is provided via an external pluggable transceiver module, otherwise SHOULD.
H14	SHOULD	Tamper switch, which signals access to the battery and SIM card area, e.g., for sabotage detection.
H15	SHOULD	Embedded SIM (MFF2 eSIM) support.
H16	SHOULD	Built-in siren with min 100dB; adjustable
H17	CAN	Bluetooth 5.x incl. Virtual BT Driver API. *
H18	CAN	HDMI connection with the communication channels: Display Data Channel (DDC), Transition-Minimized Differential Signaling (TMDS), Consumer Electronics Control (CEC), HDMI Ethernet Channel (HEC) and Content protection (HDCP) according to the latest HDMI standard.
H19	CAN	Audio interfaces such as microphone with hardware kill switch and speaker that meet the requirements of leading voice assistance services.

Developer support requirements

ID	Status	Description
D1	MUST	Provision of min. 5 fully documented open reference IoT router/cube SDK devices per type/model with unlimited root access and source code for evaluation and verification.
D2	MUST	Comprehensive SDK with complete documentation, code samples, toolchain, etc.
D3	MUST	Technical support resource available. Direct contact with engineer.
D4	MUST	Support for remote troubleshooting and debugging.
D5	MUST	Provision of end-user firmware versions corresponding to the functionality of the Reference SDK devices (see D1).
D6	SHOULD	Virtualized version of platform for easy testing and debugging.
D7	SHOULD	Remote speedtest tools.

Regulatory and other certification requirements

ID	Status	Description
R1	MUST	CE, ROHS2 and other mandatory EU/CEE certifications and in the specified regions/countries.
R2	MUST	Complies with all Z-Wave, Zigbee and RF standards and regulations in the specified regions/countries to be certified or approved. The certifications by testing institutes must be documented if required by the standards.
R3	SHOULD	Wi-Fi EasyMesh certification.

Software adaptation requirements

ID	Status	Description
S1	MUST	Min. Java 6 / V1.6 (or higher) and Java Reflection support with a small and compact Java Virtual Machine that meets the associated and complete JVM specification.
S2	MUST	API/support for complete "power cycle reset" of the SH namespace, also in battery operation.
S3	MUST	Virtual Networking Driver API. *
S4	MUST	Virtual Mobile Networking Driver API. *
S5	MUST	Zigbee 3.0 Zigbee Driver API. *
S6	MUST	Z-Wave Z/IP Driver API. *
S7	MUST	Virtual LED Driver API. *
S8	MUST	Virtual Hardware button callback API. *
S9	MUST	Virtual I/O driver for any type of additional equipment. *
S10	MUST	Virtual SH namespace API. *
S11	SHOULD	Generic responsive HTML5 user interface for local device administration including CSS compliant support for custom design implementation.
S12	CAN	Generic, but standardized and/or freely licensable software abstraction layer for decoupling manufacturer-specific hardware components.
S13	CAN	SDKs or other support for the local integration of Wi-Fi/LAN based Home Automation devices of various third-party platforms or device manufacturers.

* Well defined and comprehensive API's MUST be provided for integration into applications. If existing chip vendor driver APIs are not natively available for **OpenWrt**, the driver APIs from their Linux-based SDKs MUST be ported to **OpenWrt** by the device vendor. The general provision of all driver APIs is done as an integrated part of the router FW Image/Build.

References:

- Z/IP Gateway SDK as part of via SiLabs development tool "Simplicity Studio"; current version 7.11.x
- ZigBee SDK GSDK2.6.x

** A safe CPU load on the host device of maximum 85% MUST be maintained under the assumption that 3-5 lightweight container apps with a load comparable to the SH client are executed simultaneously.

Minimal functional requirements on the hosting device due to additional service agents, clients and apps running in a container.

Monitoring and protection service "M_namespace"

Basic requirements that apply through a protection service designed for the home network and all connected (IoT) devices.

ID	Status	Description
M1	MUST	Requires about 1%-2% of CPU resources in average and 5% in load, based on MIPS MT7621S Single-Core 880 MHz CPU.
M2	MUST	Requires up to 16 MB of RAM resources.
M3	MUST	Requires up to 20MB, but SHOULD be 25MB, of non-volatile memory.
M4	MUST	Kernel modules, binaries and iptables extensions to include: Contrack ebtables iptables-mod-contrack-extra iptables-mod-ipmark iptables-mod-nflog iptables-mod-nfqueue kmod-br-netfilter libopenssl ca-certificates curl
M5	SHOULD	APIs or iptables rules to control hardware acceleration.
M6	SHOULD	LXC Containers are run in the same Network Space as the HOST for proper traffic steering.
M7	SHOULD	LXC Containers have to have an ability to run iptables commands.

Channel State Information (CSI) service "C_namespace"

Basic requirements that apply when Channel State Information (CSI) is supported.

ID	Status	Description
C1	MUST	Requires about 10%-15% of CPU resources (based on MIPS MT7621S Single-Core 880 MHz CPU).
C2	MUST	Requires about 2 MB of RAM resources.
C3	MUST	Requires about 1 MB of non-volatile memory.
C4	MUST	Restriction-free Internet access.
C5	MUST	List connected WiFi devices.
C6	MUST	Get IP Address of WiFi connected devices.
C7	MUST	Send and Receive ICMP packets to/from connected WiFi devices.
C8	MUST	Access to WiFi statistics of connected devices. See Channel State Information (CSI) requirement table.

Channel State Information (CSI) requirement table

Detail requirements that apply when Channel State Information (CSI) is supported.

ID	Status	WiFi Statistic	Description
I1	MUST	CSI	CSI for each spatial stream
I2	MUST	Timestamp	Received packet timestamp
I3	MUST	RSSI	RSSI for each received packet
I4	MUST	nTX	Number of antennas used to transmit the packet.
I5	MUST	nRX	Number of antennas that received the packet.
I6	MUST	Channel	Channel used to transmit the packet.
I7	MUST	Client MAC	The MAC Address of the WiFi device that transmitted the packet.
I8	MUST	Bandwidth	The bandwidth used for the packet transmission.
I9	MUST	Number of Subcarriers	Number of subcarriers in the CSI.
I10	MUST	Number of Spatial Streams	Number of Spatial Streams in the CSI.
I11	MUST	Decimation	Status and level of grouping performed for the CSI estimation.
I12	SHOULD	CSI calculation error	Status if there was a calculation error of the CSI.
I13	SHOULD	AGC Gain	Gain used by AGC applied in baseband
I14	SHOULD	Rate	Data rate used for packet transmission. Similar information available with MCS index.
I15	SHOULD	Beamforming	Status if beamforming was used for the packet transmission.
I16	SHOULD	Error Vector Magnitude	Error Vector Magnitude for the estimation of the CSI.
I17	SHOULD	MCS	The MCS index of the transmitted packet. Similar information available with Rate.
I18	SHOULD	Antenna Permutation	MUST if possible Antenna Permutation, but depending on driver and manufacturer, there may not be Antenna Permutation.
I19	SHOULD	CSI for Multi-Devices	Parallel reporting of WiFi statistics (including CSI) from more than one device connected. Only applies in Access Point mode.

Note: Unfortunately, we cannot guarantee that no printing errors have occurred despite careful preparation and checking.