

OI4 Alliance Resources

Conformance checklist for Open Edge Computing Products



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Content

| | |
|--|-----------|
| PREFACE | 5 |
| 1 OPEN EDGE CONNECTIVITY | 7 |
| 2 OPEN EDGE COMPUTING PLATFORM | 7 |
| 2.1 HARDWARE REQUIREMENTS | 7 |
| 2.1.1 MINIMUM CPU POWER AND MEMORY SIZE | 7 |
| 2.1.2 SMALL CPU POWER AND MEMORY SIZE..... | 8 |
| 2.1.3 MEDIUM CPU POWER AND MEMORY SIZE | 8 |
| 2.1.4 LARGE CPU POWER AND MEMORY SIZE..... | 8 |
| 2.2 HOST SOFTWARE REQUIREMENTS | 9 |
| 2.2.1 DOCKER FRAMEWORK..... | 10 |
| 2.2.2 MQTT MESSAGE BUS..... | 11 |
| 2.3 COMMON REQUIREMENTS FOR CONTAINERIZED APPLICATIONS | 12 |
| 2.3.1 OEC REGISTRY APPLICATION | 13 |
| 2.3.2 OPEN OPERATOR CLOUD CONNECTOR | 14 |
| 2.3.3 OT CONNECTOR..... | 14 |
| 2.3.4 IT CONNECTOR | 14 |
| 2.3.5 AGGREGATION..... | 15 |
| 2.3.6 UTILITY | 15 |
| 2.3.7 PERSISTENCE..... | 15 |
| APPENDIX | 16 |
| DOCUMENT HISTORY | 16 |

List of tables

| | |
|---|----|
| Table 1: Relevant conformity checks for this product | 6 |
| Table 2: Requirements for Open Edge Connectivity | 7 |
| Table 3: Common hardware requirements for Open Edge Computing Platform..... | 7 |
| Table 4: Minimum CPU and memory requirements for Open Edge Computing Platform | 7 |
| Table 5: Small CPU and memory requirements for Open Edge Computing Platform | 8 |
| Table 6: Medium CPU and memory requirements for Open Edge Computing Platform..... | 8 |
| Table 7: Large CPU and memory requirements for Open Edge Computing Platform | 8 |
| Table 8: Requirements for Open Edge Computing host software..... | 9 |
| Table 9: Requirements for Open Edge Computing Docker framework..... | 10 |
| Table 10: Requirements for Open Edge Computing MQTT Message Bus..... | 11 |
| Table 11: Common requirements for containerized applications | 12 |
| Table 12: Requirements for OEC Registry..... | 13 |
| Table 13: Requirements for Open Operator Cloud Connector..... | 14 |
| Table 14: Requirements for OT Connector | 14 |
| Table 15: Requirements for IT Connector | 14 |
| Table 16: Requirements for Aggregation Applications | 15 |
| Table 17: Requirements for Utility Applications..... | 15 |
| Table 18: Requirements for Persistence Applications..... | 15 |
| Table 19: Document history..... | 16 |

Preface

The requirements in this document are derived from the guidelines of the Open Industry 4.0 Alliance and the international norms and standards referenced therein.

- Open Industry 4.0 Alliance Development Guideline
- Open Industry 4.0 Alliance - Requirements for Interoperability

The following table shows the relevant chapters for the conformance check of the Open Edge Computing product (please complete):

| Chapter | Headline | Platform | Application |
|---------|---|--------------------------|--------------------------|
| 1 | Open Edge Connectivity | | |
| 2 | Open Edge Computing Platform | X | |
| 2.1 | Hardware requirements | X | |
| 2.1.1 | Minimum CPU Power and Memory Size | <input type="checkbox"/> | |
| 2.1.2 | Small CPU Power and Memory Size | <input type="checkbox"/> | |
| 2.1.3 | Medium CPU Power and Memory Size | <input type="checkbox"/> | |
| 2.1.4 | Large CPU Power and Memory Size | <input type="checkbox"/> | |
| 2.2 | Host software requirements | X | |
| 2.2.1 | Docker Framework | X | |
| 2.2.2 | MQTT Message Bus | X | |
| 2.3 | Requirements for containerized applications | X | X |
| 2.3.1 | OEC Registry application | X | <input type="checkbox"/> |
| 2.3.2 | Open Operator Cloud Connector | | <input type="checkbox"/> |
| 2.3.3 | OT Connector | | <input type="checkbox"/> |
| 2.3.4 | IT Connector | | <input type="checkbox"/> |
| 2.3.5 | Aggregation | | <input type="checkbox"/> |
| 2.3.6 | Utility | | <input type="checkbox"/> |

| | | | |
|-------|-------------|--|--------------------------|
| 2.3.7 | Persistence | | <input type="checkbox"/> |
|-------|-------------|--|--------------------------|

Table 1: Relevant conformity checks for this product

1 Open Edge Connectivity

| | | |
|-------|--|--|
| R1.1 | Signal transmission between layer1/open edge connectivity and layer2/open edge computing platform must be IEEE 802.3 Ethernet-based. | |
| Notes | | |

Table 2: Requirements for Open Edge Connectivity

2 Open Edge Computing Platform

2.1 Hardware requirements

| | | |
|-------------------------------|--|--|
| To be filled in by the vendor | | |
| CPU type and speed | | |
| RAM type and size | | |
| Flash type and size | | |

| | | |
|--------|---|--|
| R2.1.1 | A sufficiently strong power supply and industrial grade form factors are self-evident. | |
| R2.1.2 | At least one IEEE 802.3 compliant Ethernet interface, better two or more are mandatory. | |
| Notes | | |

Table 3: Common hardware requirements for Open Edge Computing Platform

2.1.1 Minimum CPU Power and Memory Size

| | | |
|----------|--|--|
| R2.1.1.1 | The minimum hardware requirements are a 1 GHz dual-core 32 Bit CPU with 1 GB RAM and 4 GB flash to run Linux or another suitable operating system. | |
| Notes | | |

Table 4: Minimum CPU and memory requirements for Open Edge Computing Platform

2.1.2 Small CPU Power and Memory Size

| | | |
|----------|--|--|
| R2.1.2.1 | The hardware requirements are a 2 GHz dual-core 64 Bit CPU with > 4 GB RAM and > 8 GB flash to run Linux or another suitable operating system. | |
| Notes | | |

Table 5: Small CPU and memory requirements for Open Edge Computing Platform

2.1.3 Medium CPU Power and Memory Size

| | | |
|----------|--|--|
| R2.1.3.1 | The hardware requirements are a > 2 GHz > quad-core 64 Bit CPU with > 8 GB RAM and minimum 128 GB SSD to run Linux or another suitable operating system. | |
| Notes | | |

Table 6: Medium CPU and memory requirements for Open Edge Computing Platform

2.1.4 Large CPU Power and Memory Size

| | | |
|----------|--|--|
| R2.1.4.1 | The hardware requirements cannot be specified in detail. The CPU architecture should follow the three main architectures ARM32V7, ARM64V8 or amd64 and the system shall be able to run a suitable operation system - likely in a virtualized manner. | |
| Notes | | |

Table 7: Large CPU and memory requirements for Open Edge Computing Platform

2.2 Host software requirements

| To be filled in by the vendor | | |
|-------------------------------|---|--|
| Operation system | | |
| Version | | |
| R2.2.1 | The host operating system should be based on linux and contain all necessary services to be able to run needed services such as Ethernet communication and Docker daemon. | |
| R2.2.2 | Overall access protection: Access to configuration interfaces such as CLI, REST api, Web-UI, Telnet, SSH shall be password protected. | |
| R2.2.3 | User and role management shall fulfill the needs of the targeted market segment. | |
| R2.2.4 | The Docker daemon is present and part of the host system. Further requirements are listed in 2.2.1 . | |
| R2.2.5 | The required MQTT broker might be part of the host system. If not, it is a component provided via Docker container. See requirements listed in 2.2.2 . | |
| Notes | | |

Table 8: Requirements for Open Edge Computing host software

2.2.1 Docker Framework

| To be filled in by the vendor | | |
|-------------------------------|--|--|
| Version of docker daemon | | |
| R2.2.1.1 | <p>Docker Engine shall be version 20.10.0 or newer. This indicates defined versions for several software packages, which are coming with the Docker daemon:</p> <pre> admin@compliance-kit-5:/home/admin\$ docker version Client: Version: 20.10.11 API version: 1.41 Go version: go1.16.10 Git commit: dea9396e184290f638ea873c76db7c80efd5a1d2 Built: Wed Nov 24 13:54:25 2021 OS/Arch: linux/arm Context: default Experimental: true Server: Engine: Version: 20.10.11 API version: 1.41 (minimum version 1.12) Go version: go1.16.10 Git commit: 847da184ad5048b27f5bdf9d53d070f731b43180 Built: Thu Nov 18 00:21:59 2021 OS/Arch: linux/arm Experimental: false containerd: Version: v1.4.12.m GitCommit: 7b11cfaabd73bb80907dd23182b9347b4245eb5d.m runc: Version: 1.0.2 GitCommit: 52b36a2dd837e8462de8e01458bf02cf9eea47dd docker-init: Version: 0.19.0 GitCommit: de40ad0 </pre> | |
| R2.2.1.2 | Global Docker configurations Requirements to be defined | |
| Notes | | |

Table 9: Requirements for Open Edge Computing Docker framework

2.2.2 MQTT Message Bus

| To be filled in by the vendor | | |
|-------------------------------|------------------------------|-----------------------------|
| Product name | | |
| Product version | | |
| Installed on hosts system | <input type="checkbox"/> YES | <input type="checkbox"/> NO |

| | | |
|----------|--|--|
| R2.2.2.1 | MQTT v3.1.1 compliant | |
| R2.2.2.2 | Authentication via username and password and/or mTLS must be enabled. Namespace "Oi4" is not reachable without authentication. | |
| R2.2.2.3 | Secure communication via TLS with CA certification must be enabled. Namespace "Oi4" is not reachable without secure communication. | |
| R2.2.2.4 | Adjustable ACL for the broker is optional allowed, but not mandatory. | |
| Notes | | |

Table 10: Requirements for Open Edge Computing MQTT Message Bus

2.3 Common requirements for containerized applications

| | | |
|---------|---|--|
| R2.3.1 | MQTT Client: Authenticates via username/password and/or nTLS only | |
| R2.3.2 | MQTT Client: Communication encryption via TLS is enabled | |
| R2.3.3 | MQTT Client: Keep alive, default 60 seconds | |
| R2.3.4 | MQTT Client: Clean session flag, default true | |
| R2.3.5 | MQTT Client: Retained message, default off | |
| R2.3.6 | MQTT Client: Quality of Service, default 0 | |
| R2.3.7 | MQTT Client: Close message set to send health (NORMAL_0) | |
| R2.3.8 | MQTT Client: Will message set to send health (FAILURE_1) | |
| R2.3.9 | MQTT Client: ClientId is set equal to container name as described in chapter 6.2 of the OEC Development Guideline. | |
| R2.3.10 | Topic scheme gets fulfilled, according to applications functionality <code>Oi4/<ServiceType>/<AppId>/<Method>/<Resource>/<Source>/<Filter></code> Base tests done with conformance validator. | |
| R2.3.11 | Payload encoding, according to OPC UA PubSub, JSON, OPC UA Specification Part 14 Base tests done with conformance validator. | |
| R2.3.12 | Docker: The MQTT broker address must be provided via broker.json in Message Bus storage as described in 6.1.1 . | |
| R2.3.13 | Docker: The MQTT broker port must be provided via broker.json in Message Bus storage as described in 6.1.1 . | |
| R2.3.14 | Docker: The MQTT broker certificate and related CA must be provided in Message Bus storage as described in 6.1.1 . | |
| R2.3.15 | Docker: The MQTT broker user and password must be provided via mqtt_credentials file in Secret storage as described in 6.1.3 . | |
| R2.3.16 | Docker: The application instance name is set equal to container name as described in chapter 6.2 . | |
| R2.3.17 | <not used anymore> | |
| R2.3.18 | Docker: The MQTT maximal message size must be provided via broker.json in Message Bus storage as described in 6.1.1 . | |
| Notes | | |

Table 11: Common requirements for containerized applications

2.3.1 OEC Registry application

| To be filled in by the vendor | | |
|---|------------------------------|-----------------------------|
| Is the standard OEC Registry from the Open Industry 4.0 Alliance Community used | <input type="checkbox"/> YES | <input type="checkbox"/> NO |
| Product name | | |
| Product version | | |
| Installed on hostsystem | <input type="checkbox"/> YES | <input type="checkbox"/> NO |

| | | |
|----------|--|--|
| R2.3.1.1 | OEC Registry is present and fulfills the actual state of OEC Development Guideline | |
| R2.3.1.2 | The OEC Registry app detects new assets on the Message Bus automatically, even when connected before OEC Registry was running (detected mam, health or other resources). | |
| R2.3.1.3 | The OEC Registry detects changes of health | |
| R2.3.1.4 | The OEC Registry monitors the health heartbeat and indicates missing assets | |
| R2.3.1.5 | The OEC Registry displays every event on the Message Bus - according to its log level | |
| R2.3.1.6 | The OEC Registry sets an event (and add it to the audit trail), whenever it detects a mismatch in schema validation of subscribed messages. | |
| R2.3.1.7 | The Registry itself acts Message Bus compliant (supports relevant messages, timings, ...) | |
| Notes | | |

Table 12: Requirements for OEC Registry

2.3.2 Open Operator Cloud Connector

| | | |
|----------|---|--|
| R2.3.2.1 | Establish a secure communication with the Open Operator Cloud | |
| R2.3.2.2 | Supports onboarding of new assets to the Open Operator Cloud if configured (mam) | |
| R2.3.2.3 | Supports onboarding of new assets to the Open Operator Cloud if configured based on AAS information model and JSON data format. | |
| R2.3.2.4 | Supports exchanging from health information to the Open Operator Cloud if configured (health) | |
| R2.3.2.5 | Sending telemetry data to the Open Operator Cloud if configured (data) | |
| R2.3.2.6 | Sending telemetry metadata to the Open Operator Cloud if configured (metadata) | |
| R2.3.2.7 | Exchange service commands e.g. for device provisioning and container management with the Open Operator Cloud | |
| Notes | | |

Table 13: Requirements for Open Operator Cloud Connector

2.3.3 OT Connector

| | | |
|----------|---|--|
| R2.3.3.1 | Detects related assets and establish a communication to them | |
| R2.3.3.2 | Supports onboarding of new assets by providing Oi4Identifier/MAM/Health/etc. to the Message Bus | |
| R2.3.3.3 | Providing telemetry Data from the assets to the Message Bus (e.g. PrimaryValue, others). This includes also the Metadata. | |
| R2.3.3.4 | Advanced OT Connectors might exchange service calls (methods) via call/reply pattern over the Message Bus. | |
| Notes | | |

Table 14: Requirements for OT Connector

2.3.4 IT Connector

| | | |
|----------|-------------------|--|
| R2.3.4.1 | <not yet defined> | |
| Notes | | |

Table 15: Requirements for IT Connector

2.3.5 Aggregation

| | | |
|----------|-------------------|--|
| R2.3.5.1 | <not yet defined> | |
| Notes | | |

Table 16: Requirements for Aggregation Applications

2.3.6 Utility

| | | |
|----------|-------------------|--|
| R2.3.6.1 | <not yet defined> | |
| Notes | | |

Table 17: Requirements for Utility Applications

2.3.7 Persistence

| | | |
|----------|-------------------|--|
| R2.3.7.1 | <not yet defined> | |
| Notes | | |

Table 18: Requirements for Persistence Applications

Appendix

Document history

| Revision | Date | Author | Changes/comment |
|----------|------------|-----------------|---|
| 0.1 | 2021-04-13 | Konrad Heidrich | Initial document |
| 0.2 | 2021-06-08 | Konrad Heidrich | Added table “Relevant conformity checks for this product” in Preface of this document Redefined that the assessor should sign this document, instead of the technical committee. |
| 1.0 | 2022-12-21 | Konrad Heidrich | Adopted requirements according to the document Open Industry 4.0 Alliance – Requirements for Interoperability |

Table 19: Document history