

Intel® Rack Scale Design Conformance and Software Reference Kit

Getting Started Guide

December 19, 2017

Revision 001



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Revision History

Revision	Description	Date
001	Initial release	December 19, 2017

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1 Introduction

1.1 Scope

The *Intel® Rack Scale Design Conformance and Software Reference Kit Getting Started Guide* covers implementing the required functions of the Intel® RSD reference architecture, including hardware, software, system setup, and standards-based APIs.

1.2 Intended audience

This guide is the starting point for developers planning to work with Intel® RSD software and conformance testing. Intel recommends reading the entire guide before starting.

1.3 Background and prerequisite information

The guide provides background and prerequisite information for the Intel® RSD documentation and the Intel® RSD conformance process. This information ensures that the process goes smoothly and efficiently. Keep in mind that the Intel® RSD code is reference software only. Developers are expected to modify the reference software and make it their own. Additional releases are forthcoming. The following steps outline a summary of all available Intel® RSD materials:

1. Read *Intel® Rack Scale Design Architecture Specification* (refer to [Table 2](#)) to gain an understanding of the hardware and components, and learn how Intel® Rack Scale Design software works with these components.
2. Read *Intel® Rack Scale Design Pod Manager User Guide* and *Intel® Rack Scale Design PSME User Guide* (refer to [Table 2](#)). These resources describe the core components and setup processes for the hardware and software components.
3. Read *Intel® Rack Scale Design Conformance Getting Started Guide* (this document, starting in [Section 2](#)) to start your design while keeping conformance testing in mind. This document covers design and test prerequisites to ensure smooth and efficient testing at the end of the development and validation processes.
4. Plan the configuration of the Intel® Rack Scale Design software components across your hardware. Decide which servers in your rack configurations will run which PSME and Pod Manager (PODM) components (also known as *agents*). For example:
 - Dedicate an Ubuntu® 14 server with a BMC (for example, 1U on any rack) to run the PSME compute and core rest interface modules. For example, Dell PowerEdge® and HP ProLiant® have this capability.
 - Dedicate a 10 GbE TOR (or other) switch to run the PSME core and networking modules.
 - Dedicate another storage server (disk controller) to run the PSME core rest APIs and storage agents/modules. This could potentially be the same dedicated server (with BMC) above for compute, as the server could also have a storage controller and additional disks.
5. Contact an Intel® RSD account representative or visit the Intel® RSD website (refer to [Table 2](#)) to acquire the required code.
6. Read *Intel® Rack Scale Design GAMI API Specification*, *Intel® Rack Scale Design Pod Manager API Specification*, *Intel® Rack Scale Design PSME API Specification*, and *Intel® Rack Scale Design Rack Management Module (RMM) API Specification* (refer to [Table 2](#)). These references will enable you to understand and work with the functional code provided, including:
 - Intel® RSD Pod Manager Reference code includes a fully functional northbound interface exposing Redfish*-aligned APIs along with code to discover, compose, and manage Intel® RSD resources.
 - Intel® RSD PSME/RMM reference code provides fully functional implementation to communicate with Pod Manager, northbound RESTful interface exposing Redfish*-aligned APIs, manage and report power/thermal data to the Pod Manager, and RMM implementations. It also includes stubs for the PSME network, compute, and chassis agents.



- Intel® RSD PSME Storage Service reference code includes fully functional remote storage service implementations with northbound RESTful APIs and creates initial iSCSI targets upon service initiation.
- 7. Build, install, and modify the PSME components on the hardware configuration (refer to the *Intel® Rack Scale Design PSME User Guide*, listed in [Table 2](#)). Modify the GAMI agents to interface with the hardware configuration.
- 8. Build, install, and modify the PODM components to talk with the PSME agents and manage the racks (refer to the *Intel® Rack Scale Design Pod Manager User Guide*, listed in [Table 2](#)).
- 9. Connect to an outside orchestration layer if one is used (for example, OpenStack*).
- 10. Read *Intel® Rack Scale Design Pod Manager Release Notes* and *Intel® Rack Scale Design PSME Release Notes* to be aware of potential issues.

Note: Contact an Intel® RSD account representative or visit the Intel® RSD website (refer to [Table 2](#)) if you run into issues, have questions, or want to provide general feedback.

1.4 Terminology

Table 1 Terminology

Term	Definition
ACL	Access Control List
BMC	Baseboard Management Controller
CA	Certificate Authority
CTS	Conformance Test Suite
GAMI	Generic Assets Management Interface
iSCSI	Internet Small Computer System Interface
ISV	Independent Software Vendor
LAG	Link Aggregation Group
PODM	Pod Manager
PSME	Pooled System Management Engine
RMM	Rack Management Module
RSD	Rack Scale Design

1.5 Reference documents and resources

Table 2 Reference documents and resources

Doc ID	Title	Location
336814	Intel® Rack Scale Design Pod Manager (PDOM) Release Notes, Software v2.2, Revision 001	http://www.intel.com/intelRSD
336815	Intel® Rack Scale Design Pod Manager (PDOM) User Guide, Software v2.2, Revision 001	
336816	Intel® Rack Scale Design PSME Release Notes, Software v2.2, Revision 001	
336810	Intel® Rack Scale Design PSME User Guide, Software v2.2, Revision 001	
336855	Intel® Rack Scale Design PSME REST API Specification, Software v2.2, Revision 001	
336856	Intel® Rack Scale Design Storage Services API Specification, Software v2.2, Revision 001	
336857	Intel® Rack Scale Design Pod Manager REST API Specification, Software v2.2, Revision 001	
336858	Intel® Rack Scale Design Rack Management Module (RMM) API Specification, Software v2.2, Revision 001	



Doc ID	Title	Location
336859	Intel® Rack Scale Design Generic Assets Management Interface API Specification, Software v2.2, Revision 001	
336860	Intel® Rack Scale Design Firmware Extension Specification, Software v2.2, Revision 001	
336861	Intel® Rack Scale Design Architecture Specification, Software v2.2, Revision 001	
336862	Intel® RSD v2.2 Solid State Drive (SSD) Technical Advisory	
RFC2119	Key words for use in RFCs to Indicate Requirement Levels, March 1997	https://www.ietf.org/rfc/rfc2119.txt
SDP0266	Scalable Platforms Management API Specification v1.1.0	https://www.dmtf.org/sites/default/files/standards/documents/DSP0266_1.1.0.pdf
DSP8010	Redfish Schema v2016.3	https://www.dmtf.org/sites/default/files/standards/documents/DSP8010_2016.3.zip

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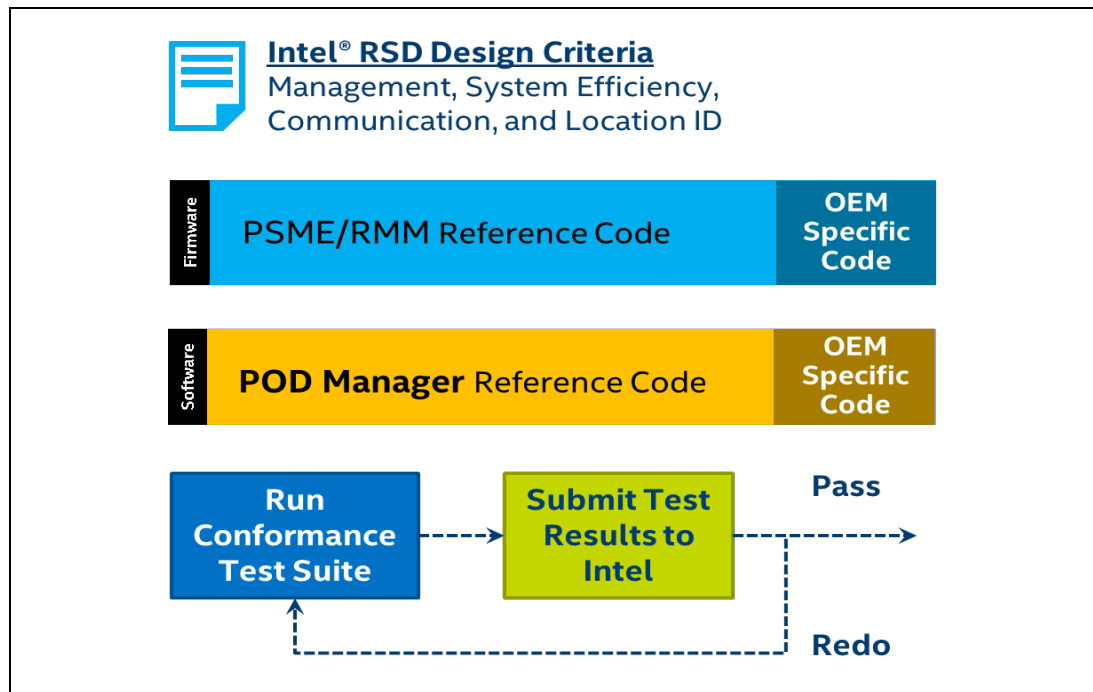
2 Intel® RSD Conformance Overview

Intel® Rack Scale Design (RSD) Conformance covers implementing the required functions of the Intel® RSD Reference Architecture, including hardware, software, system setup, and standards-based APIs. Conformance drives alignment to industry standards (driving those standards into the market), builds the Intel® RSD Ecosystem, builds end customer assurance, and reduces product development costs by improving time to market of new technologies.

Engagement with the Intel® RSD Ecosystem, illustrated in [Figure 1](#), involves the following:

- Releasing the feature complete “beta” Intel® RSD software to the open source community.
- Supporting OEM Partners to complete development of the Intel® RSD software (PSME/RMM and Pod Manager) with OEM hardware-specific code and optional OEM features.
- Supporting partners through conformance testing, which includes an automated Conformance Test Suite (CTS) tool, with manual checks.
- Working with third-party ISVs to enable orchestration solutions to work with the Intel® RSD software.

Figure 1. Intel® RSD co-development process and conformance process flow

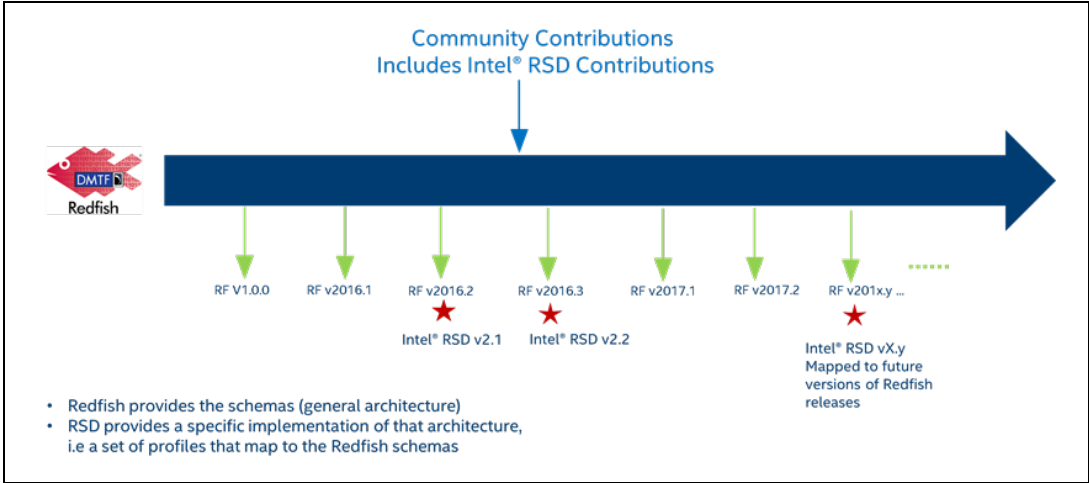


The Intel® RSD CTS tool verifies the northbound API schema conformance of the PSME/RMM and Pod Manager through automated techniques. The tool can also test some hardware and software parameters. Intel recommends completing the full conformance testing process with a manual review of the remaining system and hardware parameters. In addition, validate the rack architecture to confirm the hardware implementation is completed, as described in the *Intel® RSD Platform Design Guide* (refer to [Table 2](#)).

When discussing Intel® RSD conformance, many questions arise regarding how Intel® RSD APIs align with Redfish* APIs. Intel® RSD is mapped to the schema and models standardized by specific Redfish* versions. [Figure 2](#) shows how Intel® RSD contributes to the Redfish* community and aligns with Redfish* releases.



Figure 2 Intel® RSD mapping to Redfish* releases



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3 Intel® RSD Reference Code

Along with alignment to Redfish* schemas, Intel provides fully functional Intel® RSD reference code for the following items:

- Intel® RSD Pod Manager:
 - Northbound RESTful interface to expose Redfish*-aligned APIs
 - Discover, compose, and manage Intel® RSD resources
- Intel® RSD Pooled System Management Engine (PSME)/Rack Management Module (RMM):
 - PSME implementation to communicate with the Intel® RSD Pod Manager
 - Northbound RESTful interface to expose Redfish-aligned APIs
 - Manage and report the power and thermal matrix to the Pod Manager
 - RMM Implementations
 - Firmware (FW) extensions (conversion of IPMI to Redfish)
- Intel® RSD PSME Storage Service:
 - Remote storage service implementation with northbound RESTful APIs
 - Create initial iSCSI targets upon service initiation
- Intel® RSD Reference code provides stubs for PSME Network, Compute, and Chassis agents

Note: The Intel® RSD Reference code does NOT include all **required** Intel® RSD elements noted in the Intel® RSD Platform Architecture specification. Contact your Intel account representative with questions regarding the Intel® RSD reference code and architecture requirements.





4 Intel® RSD Product Design Prerequisites

This section reviews information to keep in mind at the start of the Intel® RSD product design process. This information is designed to help ensure smooth conformance testing at the end of the development cycle. Hardware, software, and API design prerequisites are covered.

For Intel® RSD hardware conformance, Intel engages with partners in the following ways:

- Architects from both Intel and partners collaborate and confirm the implementation of the Intel® RSD architecture.
- The Intel PAE and partners collaborate to complete the Intel® RSD hardware checklist document. The checklist covers the required items from the Intel® RSD Platform Architecture specification. For example, Intel audits the power supply and fan numbering consistency, compute blade serviceability, node reset support, and so forth.

For Intel® RSD software setup conformance, Intel engages with partners in the following ways:

- **Software Architecture:** Architects from both Intel and partners collaborate and confirm the implementation of the Intel® RSD software architecture. Implementation details include (but are not limited to):
 - Where the PSME/RMM/BMC will reside in the rack
 - APIs the partner plans to provide in addition to the Intel® RSD APIs (needed extensions for a specific design)
- **Compute Sled Telemetry:** For partners using Intel® RSD reference code, Intel includes an SMBIOS implementation to gather the needed telemetry data required for conformance (CPU, memory, BIOS, and network). For partners not using the Intel® RSD reference code, an equivalent implementation must be developed to report this data in order to pass conformance testing.
- **Location Hierarchy:** Pod Manager requires location hierarchy between the chassis and sled resources to locate composed node resources.
- **Power and Thermal Telemetry:** Functionality to display the power and thermal matrix must be implemented for conformance. The parameters in the power and thermal matrix include active power supplies, total watts consumed, and so forth.
- **PSME Network Functionality:** PSME networking conformance depends on the implementation of the required PSME network APIs.

A number of prerequisites are required to ensure Intel® RSD API conformance. Intel® RSD v2.2 includes required functionalities across the Pod Manager and PSME/RMM. Each required functionality may include the implementation of *one or more* APIs. To complete Intel® RSD conformance, all required APIs are expected to be implemented for all required functionality. [Table 3](#) covers the most common issues with Intel® RSD APIs encountered during the conformance testing process.


Table 3 Required functionalities

Pod Manager	PSME				
	Compute	Network	Chassis	Storage	PNC
PSME and PSME storage resources	TPM configuration	Switch Port configuration	PATCHING location ID for ChassisType Chassis ²	Discover and report SATA-based storage volume	Graceful restart of the PCIe* switch
Discovers rack resources	Discover BIOS/BMC, compute, memory, network matrix	StaticMAC configuration	Supports reporting OOB telemetry	Create, delete, attach, and detach iSCSI targets	Triggering PCIe* switch port action
Node composition	Event subscription	Binding/Unbinding switch port to ACL	Rack-level power and thermal matrix		Create and patch PCIe* switch zones
Support boot override operations		Associating VLAN with switch ports			Discovering logical system containing PCIe* devices (no CPU or memory) ³
PATCHing location ID for ChassisType rack ¹		LAG creation (static mode)			PATCH PCIe8 system ⁴
VLAN operations with GET, POST, and DELETE methods for a node					SecureErase operation through POST method ⁵
Power and thermal zone attributes					EraseOnDetach attribute through Delete method ⁶
Attaching and detaching PCIe* endpoint (NVMe drives) to a composed node					

1 Refer to Section 4.6.1.3 PODM 2.2 specification.

2. Refer to Section 4.8.1.3 PSME 2.2 specification.

3. Refer to Section 4.10.1.2 PSME 2.2 specification.

4. Refer to Section 4.10.1.4 PSME 2.2 specification.

5. Refer to Section 4.21.1.4 PSME 2.2 specification.

6. Refer to Section 4.21.1.3 PSME 2.2 specification.

Note: The functionalities shown in [Table 3](#) do NOT cover all **required** Intel® RSD functions. Please refer to the PSME/Pod Manager API specifications for details on all required, recommended, and optional functionalities.



5 Test for Intel® RSD Conformance

The next step is to test for Intel® RSD conformance. Some preparation is required before testing. To begin the process, complete the following tasks:

- Download the Intel® RSD v2.2 Conformance Test Suite (CTS) tool binary from Github* (refer to [Table 2](#)).
- Verify and validate the Intel® RSD architecture implementation in the hardware design checklist.
- Populate the rack with the required hardware and software components:
 - **Hardware:** Compute blades, storage servers, PCIe* devices, TOR (Ethernet) switch, PCIe* switch, cables, and power and thermal units.
 - **Software:** Pod Manager and PSME (network, compute, storage, RMM, PNC) agents.
- Enable Certificate Authority (CA) Authentication to establish a secure communication connection between the Pod Manager and PSME/RMM.
- Complete the Pod Manager and PSME/RMM conformance testing prerequisites described in this section.

For the CTS test to run successfully, a few setup tasks are required for both the Pod Manager and PSME/RMM prior to testing. These tasks streamline the testing and feedback processes for both partners and Intel engineers. Prior to running the CTS tool for Pod Manager, complete the following tasks:

- Create an Intel® RSD node with remote storage (iSCSI targets and NVMe drives), associated NICs, and VLAN.
- Create multiple logical nodes with the parameters defined in the Pod Manager API specification (section 6), including CPU, memory, drive (local and remote), and Ethernet type parameters. Verify they are populated.
- Ensure Resource Hierarchy by completing the following tasks. Refer to the Pod Manager and PSME API specifications for details. CTS will need to be reinitiated to achieve the actions noted:
 - Verify parent/child hierarchy (relationship in the rack).
 - Patch rack **ID** through the Pod Manager API, and paste the snippet to show that the **RackID** change is reflected in the Chassis **ParentID** field.
 - Create a new RSD node, and verify that the new **RackID** is displayed in the **ParentID** field.
 - Patch an existing node with an NVMe drive to verify that a new **RackID** is displayed in the **ParentID** field.
 - Reinitiate CTS to achieve all actions listed.
 - Provide CTS logs for each scenario.
- Ensure location awareness by completing the following tasks. Refer to the Pod Manager and PSME API specifications for details. CTS will need to be reinitiated to achieve the actions noted:
 - Create a new node, and verify that the node has a unique chassis ID and hierarchy.
 - Patch an existing RSD node with an NVMe drive to verify that the node has a unique chassis location ID and hierarchy.
 - Reinitiate CTS to achieve all actions listed above.
 - Provide CTS logs for each scenario.

Prior to running the CTS tool for the PSME/RMM, complete the following tasks:

- Create an Access Control List (ACL), and link the ACL rule to a switch port.
- Create an Ethernet Switch LAN, and associate an RSD logical node(s) with this VLAN.
- Create a Link Aggregation Group (LAG), and verify LAG information is visible through the Ethernet Switch APIs and on the Ethernet switch ports.
- Create a StaticMAC, and verify the StaticMAC (RSD Node MAC) is learned by the Ethernet switch port (NeighborMAC).
- Demonstrate the PSME and RMM event service subscription to the Pod Manager.
- (Optional) Support the required features for all connected switches for leaf and spine switch support, as mentioned in the PSME API, Section 4.25.
- (Optional) Implement the PSME task service APIs for Pooled NVMe functionality support.



When the tasks are completed, run the CTS tool and tests. Execute the `GET`, `PATCH`, and `CRUD` options with individual cmd and confirmation. Also, generate a separate log file for review through the CTS tool against the implemented Intel® RSD modules (Pod Manager, PSME, RMM). Send the data and any support questions to an Intel® RSD representative.

Intel representatives review the Intel® RSD conformance test results and provide feedback and troubleshooting guidance. If you find any errors with the CTS tool or process, contact your Intel® RSD representative for troubleshooting and technical escalation.

As an exception, Intel does have an Intel® RSD conformance waiver process. Conformance waivers can be investigated on a case-by-case basis. Work with your Intel® RSD representative for waiver questions and support.

Once all conformance tests pass (manual and automated), Intel grants Intel® RSD Conformance!

