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SunSpec Technology Overview

Abstract

This is the SunSpec Technology Overview, which provides an executive-level introduction to SunSpec information models and the SunSpec Modbus interface. If you are new to SunSpec, you should read the SunSpec Technology Overview first.

License Agreement and Copyright Notice

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Revision History

Version	Date	Comments
1.0	Initial	Initial release
1.1	2015-02-01	Intermediate draft
1.2	2015-02-11	Intermediate draft
1.3	2015-03-03	Intermediate draft
1.4	2015-03-27	Updated descriptions. Underlying model definitions are unchanged
1.5	2020-10-30	Updated SunSpec information model descriptions, general edits, and port to standard SunSpec document template
1.6	2022-03-01	Edits to cover page, front matter, and copyright notice. Text added section titled SunSpec Conformance and Certification.

About the SunSpec Alliance

The SunSpec Alliance is a global alliance of distributed energy industry participants, together pursuing information standards to enable “plug & play” system interoperability, grid interconnection, and secure data communications for Distributed Energy Resource (DER) and Electric Vehicle (EV) technologies. SunSpec free open standards reduce cost for consumers, promote technological innovation, and accelerate industry growth. Membership is open to corporations, non-profits, and individuals. For more information visit sunspec.org.

About the SunSpec Specification Process

SunSpec Alliance specifications are initiated by SunSpec members to establish an industry standard for mutual benefit. Any SunSpec member can propose a technical work item. Given sufficient interest and time to participate, and barring significant objections, a workgroup is formed and its charter is approved by the board of directors. The workgroup meets regularly to advance the agenda of the team.

The output of the workgroup is generally in the form of a SunSpec Interoperability Specification. These documents are considered to be normative, meaning that there is a matter of conformance required to support interoperability. The revision and associated process of managing these documents is tightly controlled. Other documents are informative, or make some recommendation with regard to best practices, but are not a matter of conformance. Informative documents can be revised more freely and more frequently to improve the quality and quantity of information provided.

SunSpec Interoperability Specifications follow a lifecycle pattern of: DRAFT, TEST, APPROVED, and SUPERSEDED.

For more information or to download a SunSpec Alliance specification, go to https://sunspec.org/about-sunspec-specifications/.

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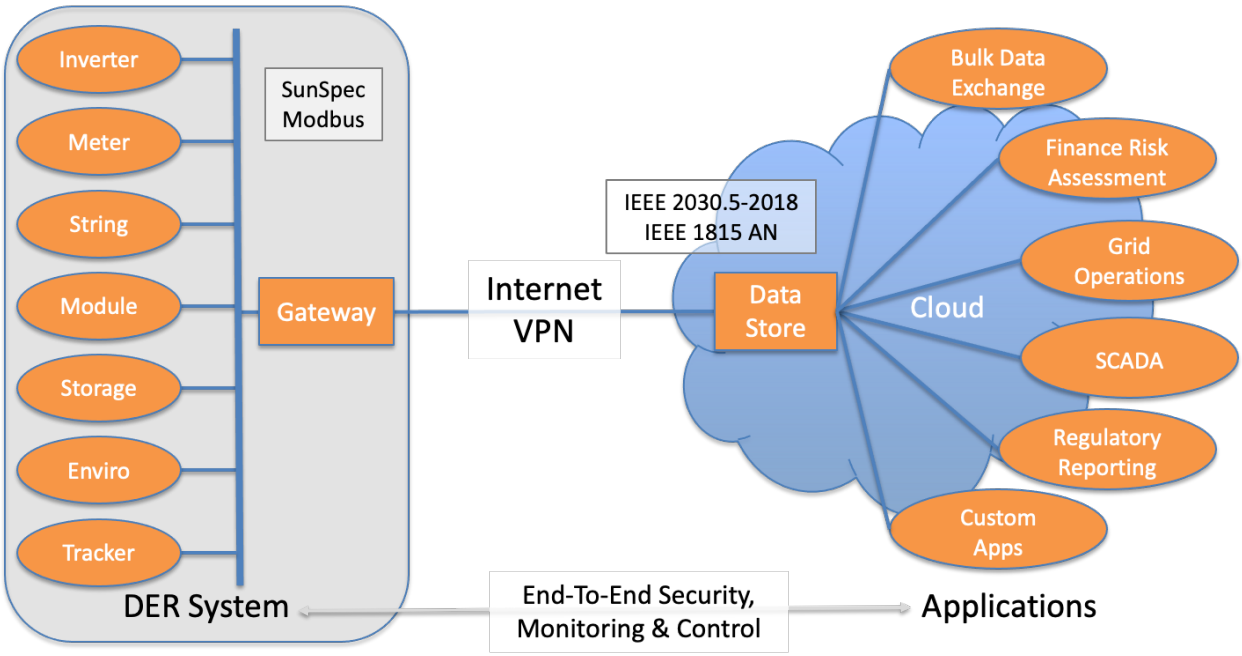
1 Introduction

The SunSpec Alliance Interoperability Specifications are a set of documents that describe information models, data exchange formats, and communication protocols used in Distributed Energy Resource (DER) systems. The following diagram illustrates the components in a complete DER system:



The specifications are intended to reduce the cost of system implementation through standardization. By enabling applications to be written using a single, standardized view of solar plant components, independent of component manufacturer and model, devices can maximize cost efficiencies and potential deployment possibilities through interoperability with other applications and devices.

All SunSpec specifications are available at https://sunspec.org/specifications/.

2 SunSpec Interfaces

Generally, DER Systems have one or more loggers, or gateways, which communicate with devices such as inverters and meters. Loggers relay the accumulated information to servers, which store data permanently and perform various analytics, and also communicate with other servers for reporting and other functions.

Loggers and devices commonly communicate using the SunSpec Modbus protocol. The SunSpec information model specifications define the communication payload content and structure that comprises the SunSpec Modbus interface.

Communication between loggers and servers and between servers is usually over the Internet, using standard internet protocols such as HTTP/HTTPS. The IEEE 2030.5-2018 standard implements these protocols and is commonly used for this application.

3 SunSpec Information Models

Device and system information is defined by SunSpec using information models. The information model defines the data points associated with logical, functional blocks and represents the functionality implemented by a device or plant.

See SunSpec Device Information Model Specification to learn more about information model specifications.

3.1 Device Information Model Definition

Model definitions is used to standardize information models and ensure interoperability among DER devices and plants. The definition logically groups information corresponding to data points and functionality implemented by the device. There is a model definition for each device information model.

3.2 Device Information Model Encoding

Device information model definitions are interface-independent. However, the canonical definition format uses JavaScript Object Notation (JSON) encoding.

Additionally, SunSpec standardizes a comma-separated values (CSV) encoding to support a spreadsheet presentation of the definitions. You can download the latest spreadsheet from https://sunspec.org/specifications/.

4 SunSpec Devices and Systems

Devices are represented by a collection of information models.

Supported device categories include:

- Inverters
- Meters
- PV Modules
- Environmental Sensors
- String Combiners
- Trackers
- Energy Storage
- Charge Controllers

Systems consist of the aggregation of devices and other information associated with the system.

Devices are certified by SunSpec for conformance to the standard. Vendor conformance statements for devices that implement the information models are published on https://Certifications.SunSpec.org.

Information model construction details can be found in the SunSpec Information Model Specification.

5 Implementing SunSpec Information Models

SunSpec information models are communication protocol agnostic. The information models have been mapped to SunSpec Modbus, HTTP/XML, OPC, and other protocols. The Modbus protocol is currently the most popular and commonly used transport protocol.

SunSpec device definitions are constructed by concatenating SunSpec information models, beginning with the Common Model and ending with the End Model.

Common Model
Standard Model(s)
Vendor Model(s)
End Model

Each SunSpec-compliant device definition includes at least three SunSpec information models:

- The SunSpec Common Model (i.e. SunSpec model 1)
- At least one standard or vendor model, which are described below
- An End Model that marks the end of the SunSpec device definition

Each information model is uniquely identified and contains a well-known identifier (ID) and length. This permits clients to browse the contents of a device and skip information models with unrecognized identifier values.

5.1 Common Model

The Common Model provides identification information associated with the physical device, such as manufacturer, model, and serial number. The Common Model is always included in a SunSpec device definition.

5.2 SunSpec Standard Models

SunSpec Standard Models specify common data points implemented by devices of a given device category.

5.3 Vendor Models

Vendor Models are defined by the device vendor and contain data points applicable only to the vendor's implementation. Vendor Models do not need to follow the SunSpec Standard Model review process but must conform to the rules governing SunSpec model definition.

A Vendor Model requires an ID assigned by SunSpec.

6 Flexibility and Extensibility

A key feature of the SunSpec approach is flexibility, which enables vendors to extend device type capabilities or develop new device types. SunSpec definition techniques support the creation of new models:

- New SunSpec Standard Models. New Models are defined using a consensus process.
- New Vendor Models. Vendor Model can be defined that includes fields and values specific to the vendor.

If you are SunSpec Alliance member, contact membership@sunspec.org if you would like to have your Vendor Models listed in the SunSpec Information Model Reference.

7 SunSpec Conformance and Certification

Vendors declare all SunSpec implementations in a Protocol Implementation Conformance Statement (PICS) document. The PICS specifies the details of a specific implementation and is used to verify conformance to SunSpec standards.

8 Standards Development Process

SunSpec Alliance members initiate SunSpec specifications. Any SunSpec Alliance member can propose a technical work item.

8.1 SunSpec Interoperability Specification

SunSpec Interoperability Specifications are considered to be normative, which means that there is a matter of conformance required to support interoperability. The document management and revision process is tightly controlled.

Other, informative documents can make recommendations on best practices but are not a matter of conformance. Informative documents can be revised more freely and frequently to improve the quality and quantity of information provided.

8.2 SunSpec Standards Workgroup

Given sufficient interest and time to participate, and barring any significant objections, a workgroup can be formed and a charter approved. The workgroup meets regularly to advance the agenda of the team.

The output of the workgroup is typically a SunSpec Interoperability Specification. Workgroups may also convene to document best practices.

8.3 Relationship to Other Standards

The SunSpec Alliance philosophy is to accelerate the advancement of interoperability by developing “de facto” standards while avoiding “reinvention of the wheel.” This implies that if previous work has been done to acceptable quality standards and intellectual property rights agreements permit SunSpec to freely adopt the work, SunSpec will actively seek to adopt the work in its specifications and best practices.

The SunSpec Alliance maintains active liaison relationships with the International Institute of Electrical and Electronics Engineers (IEEE), International Electrotechnical Commission (IEC), National Institute of Standards and Technology (NIST), the American National Standards Institute (ANSI) and other standards organizations.