

# SunSpec Technology Overview

## Spec Alliance Interoperability Specification

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### ABSTRACT

The SunSpec Specification suite consists of the following documentation:

- SunSpec Technology Overview
- SunSpec Information Model Specification
- SunSpec Information Model Reference Spreadsheet
- Collection of SunSpec Device Category Model Specifications
- SunSpec Model Data Exchange
- SunSpec Plant Information Exchange
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This is the SunSpec Technology Overview. It provides an overview of SunSpec Alliance technology. People new to SunSpec should read this executive-level introduction first.

## About the SunSpec Alliance

The SunSpec Alliance is a trade alliance of developers, manufacturers, operators and service providers, together pursuing open information standards for the distributed energy industry. SunSpec standards address most operational aspects of PV, storage and other distributed energy power plants on the smart grid—including residential, commercial, and utility-scale systems—thus reducing cost, promoting innovation, and accelerating industry growth.

Over 70 organizations are members of the SunSpec Alliance, including global leaders from Asia, Europe, and North America. Membership is open to corporations, non-profits, and individuals. For more information about the SunSpec Alliance, or to download SunSpec specifications at no charge, please visit [www.sunspec.org](http://www.sunspec.org).

## Change History

1.0: Initial version splitting out architecture document

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.

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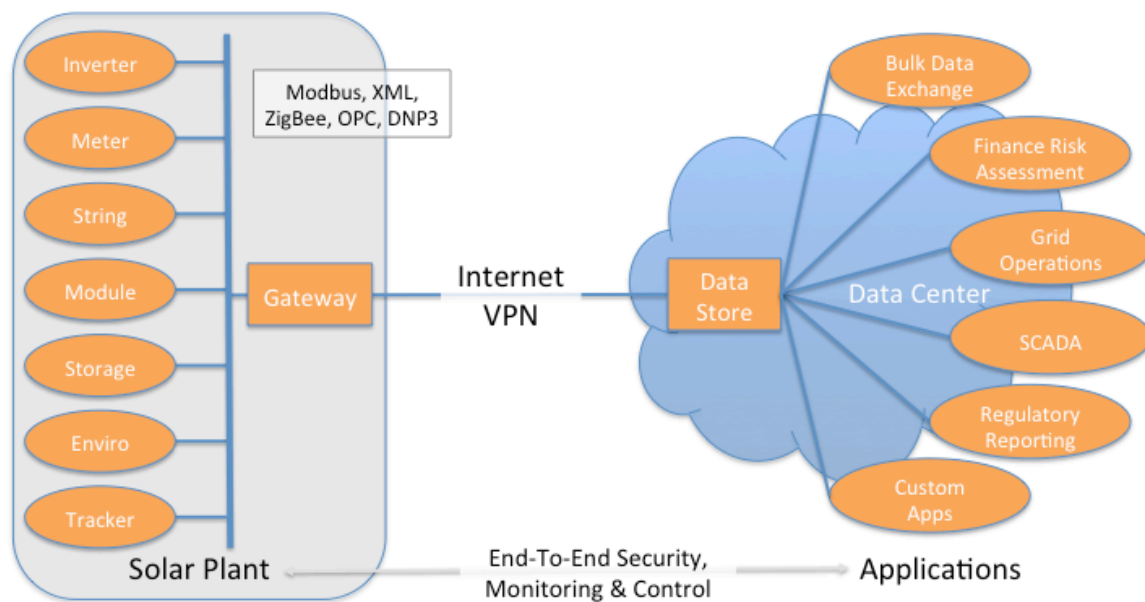
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## Introduction

SunSpec Alliance Interoperability Specifications describe information models, data exchange formats and communication protocols used in distributed energy resource systems. The diagram below depicts the components of a complete system.

The goal of the Specifications is to reduce the cost of system implementation. They enable applications to be written using a single, standard view of the components comprising a Solar Plant, independent of their components' manufacturer and model; and enable devices to maximize their potential deployment possibilities by interoperating with applications and other devices.



All SunSpec specifications are available at <http://sunspec.org/download>.

## SunSpec Interfaces

Generally, Solar Plants will have one or more Loggers (or Gateways), which communicate with Devices such as inverters and meters, and relay the information gathered to Servers, which store data permanently and perform various analytics. Servers also communicate with other Servers for reporting and other functions.

Typically, the communication between loggers and devices uses the Modbus protocol. This communication is governed by the SunSpec Information Model Specifications.

The communication between Loggers and Servers, as well as Servers and other Servers, is typically on the Internet, running standard Internet Protocols such as

HTTP. This communication is governed by the SunSpec Model Data Exchange and Plant Information Exchange specifications.

## SunSpec Information Models

Information in SunSpec is defined through a set of **Information Models** representing functionality implemented by devices or plants.

Each SunSpec Information Model describes set of data points associated with a logical functional block.

### SunSpec Model Definition XML (SMDX)

SunSpec information Models are defined using the SunSpec Model Definition XML (SMDX) encoding. Please reference the SMDX file for the definitive version of any SunSpec Information Model, at <http://sunspec.org/download>.

SMDX definitions are also represented for convenience in a spreadsheet called SunSpec Information Model Reference.xlsx.

## SunSpec Devices and Plants

Devices are represented by a collection of Information Models.

Plants consist of the aggregation of the devices in a system and other information associated with the system.

Supported device categories include:

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

Vendor conformance statements are published on SunSpec.org.

The details of information model construction can be found in the **SunSpec Information Model Specification**.

## Implementing SunSpec Information Models

SunSpec information Models are communication protocol agnostic. They have been mapped to Modbus, HTTP/XML, OPC and other protocols. Modbus is currently the most popular transport protocol in use.

SunSpec device definitions are constructed by concatenating a collection of SunSpec Information Models, starting with the Common Model and ending with the End Model. Each Information Model is uniquely identified and contains a well-known identifier and length. This allows a client to browse the contents of a device and skip Information Models with unrecognized identifier (ID) values.

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. Standard and Vendor Models are described below.
- An End Model that marks the end of the SunSpec device definition.

The SunSpec device structure is shown below:

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

### **Common Model**

The Common Model provides identification information (e.g. manufacturer, model, serial number) associated with the physical device. The Common Model is always included in a SunSpec device definition.

### **SunSpec Standard Models**

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

### **Vendor Models**

Vendor Models are defined by a device vendor and contain data points that only apply to the vendor's implementation. Vendor Models do not need to go through the SunSpec Standard Model review process but must conform to all rules regarding the creation of a SunSpec Model definition.

A Vendor Model requires an ID assigned by SunSpec.

## **Flexibility and Extensibility**

A key feature of the SunSpec approach is flexibility that allows vendors to extend the capabilities of a device type or develop new device types. SunSpec definition techniques allow for the creation of:

- New SunSpec Standard Models. New Models are defined via a consensus process.
- New Vendor Models. Vendors may also define a Vendor Model that includes fields and values specific to the vendor.

## **SunSpec Conformance and Certification**

All SunSpec implementations are declared by the vendor in a Protocol Implementation Conformance Statement (PICS). The PICS specifies the details of a specific implementation and is used for verification of conformance to SunSpec standards.

## **Standards Development Process**

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

The output of the workgroup is typically a SunSpec Interoperability Specification. Work groups may also convene to document best practices. SunSpec Interoperability Specifications 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 recommendations with regard to 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.

## **Relationships to Other Standards**

The philosophy of the SunSpec Alliance is to accelerate the advancement of interoperability by developing “de facto” standards while avoiding “reinvention of the wheel”. In other words, if good work has been done previously, and if intellectual property rights agreements permit SunSpec to adopt this work freely, SunSpec will actively seek to adopt the work in its specifications and best practices.

The SunSpec Inverter Models are inspired by the IEC 61850 information model, including the recent 90-7 extension. To be specific, the SunSpec specification has adopted IEC 61850 semantics, point naming, and encoding practices in order to harmonize SunSpec member product implementations to this important international standard.

SunSpec provides input to standards bodies for extensions to existing standards.

The SunSpec Alliance maintains active liaison relationships with the International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers (IEEE), American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), National Institute of Standards and Technology (NIST), American National Standards Institute (ANSI), and others.