# SolidModeling (Aspect)

## Overview

The **SolidModeling** aspect is used to capture geometric and spatial models and relationships. Relationships between components make it possible to compose individual component CAD models into assemblies for entire systems or subsystems.

**StructuralInterfaceRoles** express the composition rules for a component interface. These roles are defined in matched pairs (**StructuralInterfaceDefinitions**), and each role can be used by many components. When two matching roles are joined with a **JoinStructures** connection, composition constraints are created that tell the CAD tool how to align the two parts in 3D space.

## Contexts

Many areas of the CyPhy language include the SolidModeling aspect, including designs (Component Assemblies), Components, and Design Space models (DesignContainers). **StructuralInterfaceDefinition** models also use the SolidModeling aspect.

## Model Objects

### CAD File Link

A **CAD File Link** refers to the CAD model for a given **Component**. Only **Components** may have this reference.

### Structural Interface Definition

A **Structural Interface Definition** establishes the composition rules between two matching **Structural Interface Role** interfaces.

**Structural Interface Definition** models exist within **Structural Interface Definitions** folders, which in turn are created within **Components** folders. To make one, create or use an existing **Components** folder, and create a **Structural Interface Definitions** folder. Then create a **Structural Interface Definition** model within this folder.

A **StructuralInterfaceDefinition** must contain two **Structural Interface Roles.** The **Point, Surface,** and **Axis** objects within the roles appear as ports. To define the mapping between the two roles, draw connections between the matching **Point, Surface,** and **Axis** objects on each side. These features will be aligned when two objects using these roles are joined.

### Structural Interface Role

A **Structural Interface Role** contains **Point, Surface,** and **Axis** objects that represent **datums** within the CAD model.

When the role is defined (within a **Structural Interface Definition**), the “datum” attributes are not filled out, because we do not know what the name of the datum will be for every CAD model that uses this role.

When the role is used in a **Component,** the “datum” attributes are filled out, corresponding to the datums within the CAD model for that **Component.** To use a **Structural Interface Role** within a component, switch to the **SolidModeling** aspect, navigate to its definition in the browser, and drag the role into the component while holding ALT and SHIFT.

## JoinStructures Connection

### Semantics

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### Constraints and Restrictions

## Interpreters